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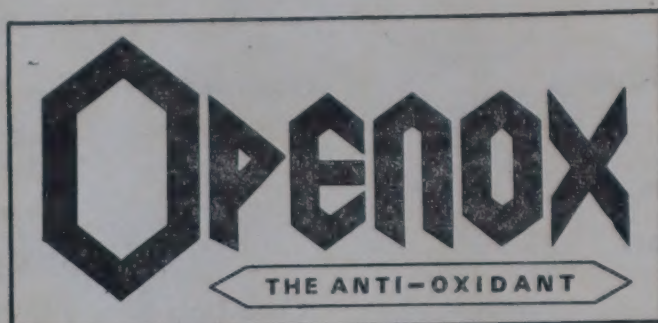
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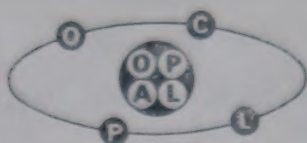


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IN MEMORIAM



Smt. K. P. Leela Nayar

Born: 28-12-1919

Died: 2-2-1975

Smt. K. P. Leela Nayar, Director, Fruit (Food Industry), Small Scale Industries, Ministry of Industrial Development, Government of India, New Delhi, died on 2nd February after a brief illness.

After her initial schooling in Vidyodaya Girls High School, Madras, Smt. Leela Nayar completed B.Sc. in 1944 from the Presidency College, Madras and Post-Graduate Diploma in Fruit Preservation and Canning in 1947 from the Indian Council of Agricultural Research, New Delhi. She obtained Certificates in Fruit Technology from Central Food Technological Research Institute, Mysore; Small Business Management Trainers and Consultants Course, Japan Productivity Centre, Tokyo; Industrial Management Training from SIET Institute, Hyderabad and Certificate in Homeopathy from Indian Homeopathic College, Jullundur.

Smt. Nayar worked in the Agricultural Department, Government of Madras, as Demonstrator in Fruit Preservation, and as Assistant Chemist, Government Factory, Kodur, Andhra Pradesh. She joined the Directorate of Fruit Utilisation, U.P. and then came down to Madras as Junior Field Officer, Small Industries Service Institute. In 1959, she was posted to Kerala as Assistant Director, Small Industries Service Institute. She was Deputy Director (Food Industry) before she took over as the Director in January, 1974.

She was a member, Association of Food Scientists and Technologists (India) and A P O Society, Japan. She visited Japan and Hong Kong in 1969.

She leaves behind her daughter, mother, sister and five brothers.

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INDIA

STUDIES ON THE INTERNAL CORROSION OF TINPLATE WITH MANGO (*Mangifera indica* L) JUICE

M. MAHADEVIAH, R. V. GOWRAMMA, W. E. EIPESON,

A. M. NANJUNDASWAMY AND L. V. L. SASTRY

(Central Food Technological Research Institute, Mysore-13)

Introduction

The world production of processed mango products during 1969-70 was reported to be about 20,000 tonnes of which India's share was reported to be 16,000 tonnes valued at Rs 37.5 million. Out of this, mango juice accounted for about 6,500 tonnes valued at Rs 14.3 million. Most of the juice canned is exported, thus contributing significantly to the foreign exchange earnings of the country. Export of mango juice in 1975-76 is estimated to go upto 20,000 tonnes valued at Rs 40 million¹. Large quantities of canned mango juice are reported to have been rejected every year because of high tin pick-up causing considerable loss to many of the manufacturing units. Experiments were, therefore, undertaken to find the effect of processing variables on internal corrosion of tinplate containers. The results of these investigations are presented in this paper.

Processing variables associated with canning such as variation of headspace, headspace oxygen, vacuum, insufficient exhaust, filling temperature, cooling and storage conditions of the cans adversely effect corrosion of tinplate containers. The influence of exhausting has been studied by Bohart² and Hirst and Adam³ with some berry fruits. Influence of headspace and vacuum has been studied by Lopez⁴ and oxygen by Catala *et al*⁵.

Materials and Methods

Materials: *Thothapuri* variety (Bangalore) of mangoes obtained from the local market and A 2½ size cans (401×411) fabricated from imported electrolytic (E-100) tinplate were used in these experiments.

Preparation and canning:

Mangoes were washed thoroughly, cut into slices without peeling and passed through the pulper. The pulp was collected separately and the pulp thus obtained was used to prepare the juice according to the recipe (Mango pulp: 35 per cent, Brix: 20°, acidity: 0.3 per cent). The prepared juice was then divided into eight batches (about 100 kg in each batch). The first batch was heated to 85°C, filled hot into cans, sealed and processed in boiling water for 30 min. and then cooled. This batch served as control.

Filling temperature:

Mango juice was heated to only 74°C which is slightly lower than the normal filling temperature. The rest of the process was same as in control (second batch).

Exhausting:

Mango juice was filled at 85°C into cans, passed through exhaust box for 7 min., sealed, processed in boiling water and cooled as in control (third batch).

Deaeration:

Mango juice was deaerated by passing through deaerator under 28.0" vacuum at 45°C temperature. After deaeration, juice was passed through pasteurizer, and filled into cans at 85°C, sealed, processed and cooled (fourth batch).

Time lag between sealing and processing:

Mango juice was filled into cans at 85°C, sealed and kept for about 3 hours and then processed in boiling water for 30 min. and then cooled (fifth batch).

Processing time:

Mango juice was filled at 85°C, sealed and processed in boiling water for 8 min. and then cooled (sixth batch).

Cooling water temperature:

Mango juice was canned as in control and after processing the cans were cooled in warm water (55°C) for 2 hours and then removed (seventh batch).

Agitation:

In the last batch, the method of canning was same as in control. The cans were shaken periodically, once in a week (30 min. each time) for 12 months using automatic shaker (80 vibrations per min. with 3" horizontal movement) at room temperature (25-30°C) (eighth batch).

Influence of nitrate:

Mango juice was prepared as described earlier and nitrate was incorporated in the form of potassium nitrate, so that the canned juice contained 2, 5 and 10 ppm of nitrate and the juice was then canned as in control.

Juice with different concentrations of mango pulp:

Four batches of mango juice were prepared so as to contain 10, 20, 35 and 45 per cent

mango pulp, all with the same Brix (20°) and acidity (0.3 per cent) and then canned as in control.

Influence of sodium citrate:

250 ppm of sodium citrate was incorporated in one batch of mango juice and canned as in control.

Effect of acidity:

Acidity was raised to 0.4 per cent in one batch of mango juice and canned as in control.

These experimental cans were stored at room temperature (25-30°C) and at 37°C and analysed periodically for 12 months.

Methods of Analysis:

Vacuum was determined by piercing type vacuum gauge. Acidity was determined by A.O.A.C. method.⁶ The pH of the samples was measured using a Beckman pH meter having a glass electrode. Total soluble solids were determined using an Abbe refractometer. Viscosity was determined by using Brookfield synchro-lectric viscometer (model LVT). Tin content from the composite sample of six cans was determined by the volumetric method described by McKenzie.⁷

Results and Discussion**Effect of processing variables:**

Among different processing variables tried, deaeration of mango juice before filling into cans helped in reducing the extent of corrosion as indicated by the appearance of the can interior and tin content in the juice which was less than that of control. After 12 months storage, tin content was 40 and 115 ppm less in deaerated samples as compared to control at R.T. and 37°C respectively (Table 1). Deaeration obviously reduces the oxygen content, which in turn reduces the acceleration effect on corrosion.

TABLE 1. *Effect of processing variables on corrosion*

Storage period (months)	Storage temperature	Particulars	Treatment							
			C	FT	Ex	DE	TL	PT	CW	AG
Initial	...	Vacuum (inch Hg)	14	13	14	13	14	12	13	...
		Tin (ppm)	30	32	21	20	51	28	55	...
		Can interior	VLF	VLF	VLF	VLF	LF	VLF	LF	...
		Quality of the product	← SATISFACTORY →							
3	R.T. (25-30°C)	Vacuum (inch Hg)	14	12	14	12	11	10	10	12
		Tin (ppm)	41	43	30	25	62	38	63	45
		Can interior	LF	LF	VLF	VLF	MF	LF	MF	LF
		Quality	← SATISFACTORY →							
...	37°C	Vacuum (inch Hg)	13	12	13	12	10	10	11	...
		Tin (ppm)	59	55	38	35	70	47	84	...
		Can interior	MF	MF	MF	LF	MF	MF	MF	...
		Quality	← SATISFACTORY →							
6	R.T.	Vacuum (inch Hg)	11	10	12	12	10	9	10	11
		Tin (ppm)	52	53	65	40	77	47	100	59
		Can interior	MF	MF	MF	MF	MF	MF	MF	MF
		Quality	← SATISFACTORY →							
...	37°C	Vacuum (inch Hg)	10	9	12	11	9	8	9	...
		Tin (ppm)	123	128	112	95	142	116	151	...
		Can interior	MF	MF	MF	MF	HF	MF	HF	...
		Quality	← SATISFACTORY →							
9	R.T.	Vacuum (inch Hg)	10	10	11	12	9	9	9	10
		Tin (ppm)	85	80	83	66	124	79	143	86
		Can interior	MF	MF	MF	MF	MF	MF	MF	MF
		Quality	← SATISFACTORY →							
...	37°C	Vacuum (inch Hg)	9	9	10	11	7	8	7	...
		Tin (ppm)	180	178	168	150	240	160	263	...
		Can interior	HF	HF	HF	HF	HF	HF	HF	...
		Quality	← SATISFACTORY →							
12	R.T.	Vacuum (inch Hg)	9	9	10	11	8	8	8	8
		Tin (ppm)	120	125	117	80	152	115	170	126
		Can interior	MF	MF	MF	MF	MF	MF	MF	MF
		Quality	← SATISFACTORY →							
...	37°C	Vacuum (inch Hg)	3	3	5	5	HS	4	HS	...
		Tin (ppm)	520	507	505	405	545	525	565	...
		Can interior	CD	CD	CD	HF	CD	CD	CD	...
		Quality	← METALLIC TASTE →							

C=Control

FT=Filling temp.

Ex=Exhausting

DE=Deaeration

TL=Time lag

CD=Complete detinning

PT=Processing time

CW=Cooling water

AG=Agitation

VLF=Very light feathering

LF=Light feathering

[Same abbreviations are applicable in other tables]

MF=Medium feathering

HF=Heavy feathering

SD=Slight detinning

MD=Medium detinning

HD=Heavy detinning

HS=Hard Swell

The acceleration effect of oxygen on corrosion in the case of canned apricot has been studied by Catala *et al.*,⁵ who found higher oxygen concentration increased the tin content.

Exhausting of filled cans before sealing helped in reducing the extent of corrosion only in the initial stages. The effectiveness of proper exhausting in extending the shelf-life of cans has been shown by Bohart.² Hirst and Adam³ showed that omission of exhausting resulted in the reduction of shelf-life with loganberries and damsons. However, on long storage exhausting did not help in reducing feathering and detinning in canned mango juice.

There was no appreciable difference in corrosion between control cans and the cans with processing variables such as low filling temperature or less processing time. In packs of loganberries and damsons, Hirst and Adam³ showed that shelf-life of the cans decreases if the filling temperature is low. With mango juice, low filling temperature did not increase the corrosion. Culpepper and Moon⁸ found that increased severity of process increases the extent of corrosion of tinplate with pumpkin. On the contrary, Bohart² reported that longer processing time reduced corrosion in the Anne cherries, strawberries and loganberries. In the case of canned mango juice, low processing time showed slight beneficial effect in reducing feathering only in the initial stages, but longer processing time causes more feathering and detinning which does not agree with the report of Bohart.²

Time lag between sealing and processing as well as high cooling water temperature accelerated corrosion as shown by high tin content, feathering and detinning as compared to control (Table 1). Hirst and Adam³ suggested that the cans should be cooled at about 100°F to avoid stackburning. In mango juice also, it may be possible to reduce the extent of corrosion by cooling cans at this temperature.

Intermittant agitation of cans did not accelerate corrosion, which agrees with the observation of Hirst and Adam³ who reported that intermittant agitation of cans did not have much effect on corrosion but Carrasco⁹ considered that prolonged agitation of cans accelerated corrosion.

These observations indicate that by taking proper precautionary measures at the time of processing it is possible to reduce the extent of corrosion in canned mango juice as mentioned above.

Influence of nitrate:

As shown in Table 2, the presence of nitrate accelerated corrosion depending upon its concentration. At 2 ppm level, the difference in the extent of corrosion was not appreciable. But at 5 and 10 ppm level, nitrate caused more feathering and detinning and the tin content was also high as compared to control. Horio *et al.*¹⁰ studied the mechanism of nitrate induced corrosion while finding out the cause of excessive corrosion of canned orange juice. Strodtz and Henry¹¹ showed that the rate of detinning by nitrate was negligible at pH 6.0 and increased with decreasing pH below 6.0. In the case of mango juice the pH was around 4.0 and therefore in presence of added nitrate there was enhanced corrosion.

Effect of varying pulp content:

Corrosion was found to be less with increase in the concentration of mango pulp in the juice. Ten per cent mango pulp in the juice caused more feathering and detinning and the tin content was also more as compared to other samples throughout the storage period. Complete detinning of the can interior was noticed after 9 months storage at 37°C with 10 per cent mango pulp and the tin content of this sample was 412 ppm as against 158 ppm with 45 per cent mango pulp (Table 3). After 12

TABLE 2. Influence of nitrate on corrosion

Storage period (months)	Storage temperature (°C)	Nitrate added (ppm)	Particulars		
			Vacuum (inches Hg)	Tin (ppm)	Can interior
Initial	...	Control	14	30	VLF
		2	13	35	VLF
		5	13	40	LF
		10	12	48	LF
3	R.T. (25-30°C)	Control	13	42	LF
		2	12	50	LF
		5	12	75	MF
		10	10	86	MF, SD
	37°C	Control	13	56	MF
		2	10	67	MF, SD
		5	10	113	HF, SD
		10	8	161	HF, SD
6	R.T.	Control	11	50	MF
		2	11	82	MF, SD
		5	10	97	MF, SD
		10	8	146	MF, MD
	37°C	Control	10	120	MF, SD
		2	9	139	HF, SD
		5	8	152	HF, MD
		10	6	189	HF, MD
9	R.T.	Control	10	89	MF, SD
		2	10	98	MF, SD
		5	9	122	MF, SD
		10	6	150	MF, MD
	37°C	Control	9	173	HF, MD
		2	8	198	HF, MD
		5	6	285	HF, HD
		10	4	310	HF, VHD
12	R.T.	Control	9	125	MF, SD
		2	9	140	HF, SD
		5	8	158	HF, MD
		10	6	189	HF, MD
	37°C	Control	4	500	CD
		2	0	500	CD
		5	HS	520	CD
		10	HS	532	CD

VHD=Very heavy detinning.

months storage at R.T. (25-30°C) tin content was almost double in the juice containing 10 per cent pulp as compared to the juice containing 45 per cent pulp, and at 37°C all the concentrations of mango pulp showed complete detinning except in the case of 45 per cent pulp, which showed heavy feathering and heavy detinning. The

initial viscosities of the mango juice samples with varying pulp content (Table 3) indicate that the extent of corrosion increased with decrease of viscosity occurring as a result of dilution.

Lopez⁴ made similar observations in the case of canned apple sauce. It is theorized that thinner consistency product allows for

TABLE 3. *Effect of varying pulp content on corrosion*

Storage period (months)	Storage temperature	Pulp content %	Particulars		
			Vacuum (inches Hg)	Tin (ppm)	Can interior
Initial	---	10 (23 centipoise)	10	53	LF
		20 (28 centipoise)	12	36	VLF
		35 (145 centipoise)	13	30	VLF
		45 (297.5 centipoise)	13	26	VLF
3	R.T. (25-30°C)	10	9	83	MF, SD
		20	11	60	MF
		35	12	41	LF
		45	12	32	LF
	37°C	10	8	103	MF, SD
		20	10	83	MF, SD
		35	12	60	MF
		45	12	50	MF
	R.T.	10	8	95	MF, SD
		20	10	86	MF, SD
		35	11	75	MF
		45	12	68	MF
	37°C	10	6	207	HF, MD
		20	9	150	HF, SD
		35	11	123	MF, SD
		45	11	106	MF
9	R.T.	10	7	139	MF, MD
		20	9	105	MF, SD
		35	11	83	MF
		45	11	71	MF
	37°C	10	5	412	CD
		20	8	292	HF, HD
		35	10	165	HF, MD
		45	10	158	MF, MD
	R.T.	10	5	180	HF, MD
		20	7	153	HF, MD
		35	9	120	MF, SD
		45	10	87	MF
	37°C	10	HS	550	CD
		20	HS	525	CD
		35	23	520	CD
		45	5	402	HF, HD

faster movements of ions and higher rate of diffusion facilitating greater concentration of corrosion producing substances in the vicinity of the can body and eliminating the products of reaction quickly. On the other hand, in thicker consistency medium,

products of reaction accumulate around corrosion points and oxygen is depleted slowing corrosion reactions. Similar mechanism is possible with mango juice containing different concentrations of mango pulp.

Influence of sodium citrate and acidity

The presence of sodium citrate at the concentration of 250 ppm, added to act as buffer, did not show any significant inhibiting effect in reducing corrosion (Table 4). The possibilities of disodium phosphate and sodium citrate acting as inhibitors of corrosion under certain conditions have been mentioned by Morris and Bryan¹⁴ and Adam¹⁵. However, the addition of sodium citrate to mango juice

did not show much beneficial effect in reducing corrosion.

Increase in the concentration of acid to 0.4 per cent caused more feathering and detinning. After 9 months storage at 37°C, tin content was 70 ppm more than the control containing 0.3 per cent acidity (Table 4). After 12 months storage at 37°C, hard swell was noticed in the cans with more acidity. Kohman and Sanborn¹⁶ studied the beneficial effect of citric acid

TABLE 4. *Influence of sodium citrate and acidity*

Storage period (months)	Storage temperature	Sample	Particulars		
			Vacuum (inches Hg)	Tin (ppm)	Can interior
Initial	...	C	14	41	VLF
		Sc	13	25	VLF
		A	13	43	LF
3	R.T. (25-30°C)	C	13	45	LF
		Sc	13	38	LF
		A	12	65	MF
	37°C	C	12	58	MF
		Sc	13	51	MF
		A	11	105	MF, SD
	R.T.	C	12	75	MF
		Sc	12	73	MF
		A	10	90	MF, SD
6	37°C	C	11	125	MF, SD
		Sc	10	120	MF, SD
		A	8	158	MF, MD
	R.T.	C	10	88	MF, SD
		Sc	11	79	MF, SD
		A	9	120	MF, SD
	37°C	C	8	162	MF, MD
		Sc	9	150	MF, MD
		A	6	232	HF, HD
12	R.T.	C	8	130	MF, SD
		Sc	9	119	MF, SD
		A	7	156	HF, SD
	37°C	C	3	510	CD
		Sc	4	480	HF, HD
		A	HS	540	CD

C—Mango juice (control)
 Sc—Mango juice + Sodium citrate
 A—Mango juice of 0.4% acidity

and lemon juice in reducing corrosion in the case of pureed prunes. Such beneficial effect was not obtained in the case of mango juice. Hirst and Adam¹⁷ inhibited corrosion in the case of cherries by adding 0.2-0.3 per cent citric acid but larger additions of acid accelerated the corrosion reaction. In the case of canned strawberries and raspberries, addition of citric acid accelerated corrosion. These results agree with the results obtained in canned mango juice.

Summary

Among different processing variables tried, deaeration of mango juice before filling into cans helped in reducing the extent of corrosion. Exhausting of filled cans before sealing and reduction in processing time helped in reducing the extent of corrosion to some extent only in the initial stages. Low filling temperature or less processing time did not show any appreciable difference in corrosion as compared to control cans. Time lag between sealing and processing and high cooling water temperature accelerated corrosion. Intermittent agitation of cans did not accelerate corrosion. The presence of nitrate above 5 ppm level accelerated corrosion. Corrosion was found to be less with increase in the concentration of mango pulp in the juice. The presence of sodium citrate did not show beneficial effect in reducing corrosion. Increase in the concentration of acid accelerated corrosion.

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QUALITY FACTORS IN HORTICULTURAL PRODUCE IN RELATION TO PROCESSING

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The successful application of technology of fruit and vegetable preservation coupled with the judicious approach to the selection of desirable quality raw materials and processing conditions will positively ensure best quality in processed commodity. Potential scope of establishing horticulture based processing industries on sound footing is emphasized.

Horticultural crops are of greatest economic interest to our country on which an immense scope has been predicted in recent years. The numerous varieties of fruits and vegetables cultivated throughout the country provide an unusual diversity of produce both for fresh consumption and for the processing industry. Intensive cultivation of horticultural crops in new acreages and the adoption of scientific orcharding practices indicate the possibility of surplus production of fruits and vegetables in the near future. Establishment of horticulture based processing industries needs no special emphasis when viewed against the background of expected increase in the production. Recently substantial attention has been paid to gear up horticultural industry to achieve the dual objectives of increased food production and development of a sector offering sizeable export potential. Banana, citrus, mango, onion and potato are the important fresh export commodities of our country and the major export oriented processed items include mainly mango products

like mango juice, pulp, pickles and chutneys. A great potentiality exists for the processing of banana, grapes, pineapple, tomato products and canned vegetables. Processing of horticultural produce permits a widespread distribution of these commodities and enables the equalization of market price fluctuations during the peak production period. In addition, these offer a profitable channel for surplus commodities thereby providing constant encouragement behind the sales promotion and processing functions of the industry.

Till recently, horticultural crops with major status and good promising quality were not exploited fully. Most of the indigenous fruits and vegetables were basically used for fresh produce trade and were largely undeveloped from the processing point of view. A thorough developmental approach in this direction is of practical importance in establishing horticulture based processing industries on sound basis. Some of the major factors which influence the quality of horticultural produce in relation to processing deserve due attention

by the growers, horticultural scientists and processing technologists with respect to the following considerations.

1. Varietal suitability and quality attributes in horticultural crops with special emphasis on processing technology,

2. Raw material quality control at the production point,

3. Adoption of scientific orcharding practices by growers in raising horticultural produce to meet the specific quality requirement of processing industries,

4. Horticultural research as a tool in identifying and solving the problems faced by growers and processors,

5. Breeder's effort to evolve high quality fruits and vegetables with special processing characters, and

6. Quality factors in horticultural crops at maturity and harvest and post-harvest quality control.

The successful application of fruit and vegetable preservation technology coupled with the judicious approach to the selection of desirable quality raw materials and processing conditions will positively ensure best quality in processed commodity. A wide range of processing methods are employed for fruit and vegetable preservation of which canning, freezing, dehydration, pickling, brining, sulphuring, juicing, concentration and fermentation are of great importance from the point of view of raw material quality. Every fruit and vegetable has a characteristic appearance, colour, odour, taste and texture which are usually associated with normal quality and a slight deviation results in abnormal character. Varietal suitability for processing is also an important consideration. Certain varieties give products of higher quality than do certain other varieties and the processor must therefore take this fact into account in securing the raw

material for processing. The specific requirement of quality factors in horticultural produce is a function of the method employed for preservation and hence each crop deserves its own specification with respect to specific uses. Thus juicy and fibrous mango varieties are not suitable for canning, but can be used for squashes, chutneys or pickles. Fibre free, satisfactory texture after heat processing, attractive colour and flavour are desirable qualities in mango varieties for processing. In pineapple canning quality is decided by fruit weight, shape, porosity, internal colour, per cent sugar, acidity, pH and a strong flavour; whereas pineapple juice or jam can be manufactured as a by-product from canning waste such as cores, trimmings, undersized, over ripe and soft fruits. Similarly, tomatoes for canning require fruits of moderately large size, smooth surface, uniform ripening character, deep red colour, high ascorbic acid content and relatively large portion of solid meat with good flavour. Soft juicy varieties with yellow or purple colour are not preferred for canning. For ketchup, sauce and puree tomatoes with smooth skin, wrinkleless surface, shallow stem cavity, deep red colour, firm flesh and small seed cavity are to be selected. These indicate the existence of wide spectrum in quality attributes with respect to individual crops. In general, vegetables for canning should be uniform in colour and quality, tender and high nutritional quality. Similarly, the major quality factors of fruits for juice preparation are a marked agreeable flavour, characteristic aroma, sufficiently large amount of sugar, should not be flat or insipid flavour and a slight tartness. In addition, juice should also retain its characters satisfactorily during processing and storage.

Fruits and vegetables are highly perishable commodity and hence a slightest exposure to adverse conditions during

processing or storage causes significant damage to the product quality. A rigid control over the processing operations accomplish least possible injury to the fresh flavour, nutritive value and other desirable quality present in raw material. Adaptability of different kinds of fruits and vegetables for various processing methods is an important parameter in raw material selection for processing. Fruits and vegetables like peach, apricot, cherries, pineapple, grapefruit, peas and bean can successfully freeze, whereas, banana, avocado, guava, grapes, tomato and cabbage are not good for freezing. Similar variability could be noticed in fruits and vegetables for canning, dehydration and other methods of preservation. Even within a given kind of fruit or vegetable, varieties respond differently and special care has to be taken in choosing the suitable processing methods.

The most important requisite for getting a good quality product is the use of sound raw material and strict inspection for quality at the production stage in orchards. Various attributes of raw materials and of the processed products are used as criteria in grading size, colour, maturity, freedom from damages by mold or insects. The processor is primarily interested in qualities like colour, flavour, appearance, texture and composition in contrast to the growers concern with yield potential, disease resistance and adaptability to agro-techniques. Hence quality of excellence is to be considered by striking a common parameter meeting these requirements. Horticultural crops of highest possible quality are required to get a fine processed commodity. Only wholesome fruits which meet the legal quality standards should be used for processing. It is not safe to assume that a variety with high quality in fresh state will necessarily make top quality products. Effects of seasonal growing condition, stage of maturity at harvest,

post-harvest handling methods and processing technology employed decide the final product quality to a great extent.

The practice of orchard establishment and management is undergoing a change as a result of increased awareness of quality factors in raw materials. The technical requirement of processors relating to quality and regular supply necessitates the growers to go for the adoption of scientific orcharding practices. Horticulture crops must be carefully grown making use of an intelligent programme of fertilization, irrigation and other practices to have a firm control over the quality of produce. Adoption of modern technology and scientific cultural practices involve more expenditure for use of improved planting materials, fertilizers, plant protection chemicals, farm mechanization and other practices. Growers effort to produce quality produce will definitely be rewarded by remunerative return.

Establishment of horticultural industry on sound basis will be uneconomical unless processing industry keeps pace with the increased production of horticultural produce due to the developmental programmes. Several major considerations in scientific orcharding include selection of superior quality varieties with special processing characters, plant nutrition requirements, control of plant diseases, harvesting at optimum maturity and the development of suitable processing technology with respect to the promising varieties. The Indian Institute of Horticultural Research, Hessaraghatta, Bangalore, is tackling the problems of horticultural industry on a multi disciplinary approach. Work on a number of projects oriented towards solving the major problems are underway. These include crop improvement by breeding methods, standardization of agro-techniques, physiology of flowering and fruit development, plant nutrition studies, control of plant diseases and insect pests, fixing maturity

standards, pre- and post-harvest of fruits and vegetables. The results are of immense use in identifying and solving major problems faced by the growers and processors. A number of superior types of fruits and vegetables have been recommended on the basis of rigorous screening of their genetic stock. Grape varieties which hold promise include varieties like Bayan Sherei, Chenin Blanc, Excelsior, Feteasca Alba, Ova Pagola, Rekasetali and white Riesling for dry white table wine; Black Champa, Black Muscat, Black Cornichen, Convent Large Black, Feteasca Neagra, Gamsa, Muscat, Red Prince, Rubi Red, Saperavi, Tievosa and Zinfandel for red dry table wine and Black Champa and Convent Large Black for sweet dessert wine of superior quality. In strawberry and guava, outstanding selections have been made. 'Dwarf Cavendish' and Robusta banana varieties are recommended for commercial cultivation. Pineapple variety 'Kew' holds promise for processing industry. A number of new vegetable varieties with good yield potential, nutritive value, cooking and transport quality have been released for commercial cultivation. Researches on standardization of agro-techniques, plant disease control and use of growth regulator for quality improvement have produced useful results. Maturity standards have been worked out in a number of fruits. Application of these results will be of practical importance for the successful development of horticultural industry.

The desires of consumers and processors constitute the basis of planning new and improved characters in horticultural crops. Breeders are on constant effort to evolve high quality varieties with suitable processing characters. Varieties alter as time goes on, some succumb to genetic breakdown or virus disease and show general loss in vigour. Hence careful testing of varieties for a number of seasons is very important. Breeding will also take care of improvements

in disease resistance, appearance, transport and storage quality, flavours, chemical composition, nutritive value and other processing characters in fruits and vegetables.

Horticultural crops should be harvested in a manner so as to obtain and preserve the highest quality possible. The maturity of fruits and vegetables at the time of harvest is closely inter-related with the quality of processed commodity. The retention of texture during processing is greatly decided by the stage of maturity at the time of harvest. The maturation has also a marked effect on the nutritional quality. Fruits are usually best for canning at firm ripe stage before they become soft. Similarly, in vegetables like pea or bean for canning, freezing etc. maturity is of critical importance. In addition to choosing varieties of high processing quality the processor must also make certain that it is harvested at as near optimum maturity as possible. Close contact between the processors and growers in fixing optimum harvesting stage is also an important consideration. Optimum maturity directly correlates with processing methods employed and the type of product to be prepared from the raw materials. Thus degree of maturity considered best for canning may not be best for making jam or freeze preservation; there is also a great scope for raw quality maintenance of horticultural produce by improving harvesting methods.

Fruits and vegetables, being highly perishable, deserve top priority in their utilization scope as their post-harvest retention in orchard or processing units is limited to a very short period. Establishment of processing centre near the orchards will help in quality retention to a great extent. But this is not always possible because of obvious reasons. Transportation of fruits and vegetables from orchards to the processing centre involves a great risk

of quality degradation. Flavour, crispness, nutritive value and other constituents of quality are lost more or less rapidly even under the best conditions of transportation and storage systems. In such cases adoption of scientific practices in harvesting, packaging, storage and transportation enables the retention of quality for a prolonged period.

The close observations and the healthy integration of quality factors in horticultural

produce from the stage of production, procurement, grading, processing, packing and storing result in attaining processed commodity of highest possible quality. The careful selection and utilization of choicest varieties of fruits and vegetables specially suitable for processing are by no means of secondary importance, while, considering their quality factors in relation to processing.

FOR STAINLESS STEEL

STEAM JACKETED PANS; PULPERS; STRAIGHT LINE EXHAUST BOX; RETORTS; TUBE TYPE HEAT EXCHANGERS; MINCERS; SCREW TYPE JUICE EXTRACTORS; PEA HULLERS; ELECTRO-MAGNETIC VIBRATING GRADERS; BOTTLE WASHING AND FILLING MACHINES; FRUIT AND VEGETABLE WASHING; AUTOMATIC PICKLE FILLING; HYDRAULIC BASKET PRESS; BLANCHING AND LYE PEELING; POTATO WASHER CUM PEELER; SLICER; SHREDDER; JAM FILLER; COCONUT GRATING MACHINE; PINEAPPLE PUNCHERS; CORERS; EYE REMOVERS; KNIVES FOR FRUITS AND VEGETABLES; PULPER SIEVES; AND OTHER FOOD CANNING MACHINERY.

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PROCESSED FRUITS AND VEGETABLES: NATIONAL AND INTERNATIONAL STANDARDS

DR HAKI BHAGWAN

(Director (Agri. and Food), Indian Standards Institution, New Delhi)

1. Background

1.1 In early sixties it was felt by the industry that Indian Standards Institution should compile detailed Indian Standards for processed fruits and vegetables, specially those items which have an export market. Accordingly, during 1964-70, ISI compiled 24 Indian Standards covering mango, mango pulp, pineapple, orange segments, peas, okra, karela, tomatoes, tomato puree and tomato paste (all canned); tomato juice; tomato ketchup; mango nectar; mango chutney; pickles; peas, carrots, potatoes, cabbage and okra (all dehydrated); orange juice; fruit jams, jellies and marmalades; synthetic syrups; and fruit squashes. All these Indian Standards were based on the corresponding FPO (Fruit Products Order) Standards. As FPO Standards were available to ISI and because Indian Standards were compiled in close consultation with CFTRI (Central Food Technological Research Institute, Mysore)—an approved laboratory under FPO for processed fruits and vegetables—certain specification limits given in FPO were reconsidered in the light of data available with CFTRI. In addition, the Indian Standards were elaborated and made more specific to each product and an attempt was made to include grading of fruit/vegetable on the basis of sensory evaluation.

1.2 While implementing Indian Standards, it was found that bulk production of the industry related to products, such as

juices, jams, jellies and marmalade squashes; and in-process inspection was imperative in these cases as the quantity of fruit cannot be estimated in the end product. Since these in-process inspection facilities were being considered for augmentation by the authorities administering the FPO, ISI did not want to duplicate the effort of FPO for the entire range of products being processed by the fruit and vegetable industry. Thus, despite repeated request, ISI has not been granting its Certification mark to any industry in this field. However, today the situation is different, as the actual in-process facilities have fallen short of the planned facilities. Further, the data from the industry (most often having inadequate testing facilities) were not fed back to ISI. It has therefore not been possible to up-date the Indian Standards. Similarly, no attempt has been made to up-date FPO Standards. As consequence, the industry has not been able to reap full benefits of standardization.

1.3 In the meantime, that is during the last decade, the Committee on Processed Fruits and Vegetables of FAO/WHO Codex Alimentarius Commission has held about 10 meetings at which experts from about 25 countries, including India, have taken an active part. As a result of these international meetings, specifications for about 40 items have been compiled; an up-to-date list of these standards along with its various stages is given in Appendix A.

1.4 Simultaneously, another committee, namely, SC 3 Fruits, Vegetables and Derived Products, of TC 34 Agricultural Products Technical Committee of International Organization for Standardization (ISO) has also been active in the international field. For this committee, liaison has been maintained by ISI. ISO/TC 34/SC 3 has compiled a number of Recommendations specially on the methods of test and storage and transport conditions of fruits. An up-to-date list of these Recommendations is given in Appendix B.

1.5 An assessment of the entire standards activity in an integrated manner shows that national standards activity has not kept pace with the work in the international sphere. This paper illustrates this gap and suggests specific actions for bridging this gap.

2. An Example—Pineapple

2.0 For the purpose, let us examine one specific case canned pineapple—an item on which there is a generalized FPO specification (i.e. Specification for Canned and Bottled Fruits); an Indian Standard, namely, IS:2862-1964 and a published Standard from the Codex Alimentarius Commission, namely CAC/RS 42-1970. An in-depth comparison of these three standards reveals the following.

2.1 Styles or various manners of presentation of pineapple are covered only in a general manner under the FPO standard which prescribes that the fruit should be cut into halves, one-fourths, cubes or pieces. The Indian Standard mentions specific styles typical to this fruit, namely, slices, rings, segments, wedges, chunks, cubes or tidbits. The Codex standard gives an exhaustive list of 12 styles, namely, whole; slices or spiral slices or whole slice or rings; half slices; quarter slices; broken slices; spears or fingers;

tidbits; chunks; diced or cubes; pieces; chips and crushed; and crisp cut.

2.2 In the generalised FPO specification the dimensional sizes of various styles of pineapple are not given. The Indian Standard prescribes thicknesses of slices and dimensional range of chunks. The Codex standard does not prescribe the thickness of slices but stipulates the dimensional range of fingers, tidbits, chunks and diced cubes.

It should be noted from 2.1 and 2.2 that a broader range of styles and its manner of presentation in the Indian and Codex standards offer a greater scope to manufacturers for fully utilizing the fruit and in turn consumers are able to get a greater variety from which they can make their choice to suit their specific requirements.

2.3 The Codex standard prescribes three different packs depending upon the medium of packing. The Indian Standard covers only one type of packing, namely, pineapple in syrup having a drained weight of 50 per cent minimum; this corresponds to the regular pack of the Codex standard. Codex provisions of heavy pack containing at least 73 per cent drained fruit weight and solid pack containing 78 per cent drained fruit weight are specified neither in the Indian Standard nor in the FPO standard.

Generally, heavy pack and solid pack are not being produced in the country but it might be worth-while to work out the economics of their production and marketing, and if justified divert increased production for heavy and solid packs. Prima-facie marketing of chips or crushed styles under heavy and solid packs should be economically advantageous as it would reduce packaging costs.

2.4 Regarding covering medium, that is syrup, the FPO requirement is that it should be clear. In addition, the Indian

Standard prescribes its brix as 19-26 degrees, pH as 4.5 maximum and acidity per cent between 0.3 and 0.8. The Codex standard prescribes four different types of covering media, namely, water, pineapple juice, dry nutritive sweetener and syrup. In the case of syrup again four different categories with 10, 14, 18 and 22 degrees brix have been prescribed.

The detailed provisions of Codex standard offer a wider scope to manufacturers for processing the fruit at its different stages of maturity.

2.5 The FPO standard does not define blemish, broken, flavour, colour, texture, and uniformity of size and shape. These definitions have been attempted in the Indian Standard and they are more exhaustively covered in the Codex standard.

2.6 Regarding absence of defects, the FPO provisions are unspecific. In the Indian Standard permissible limits for blemished units and disintegrated proportion have been stipulated. In the Codex standard permissible 'units with excessive trim' and 'blemishes or blemished units' have been specified for each style of pineapple.

It would be seen that in more elaborate Indian Standard and Codex Standard, an attempt has been made to eliminate subjective elements in quality inspection as far as possible.

2.7 The FPO standard, Prevention of Food Adulteration Rules and the Indian Standard do not permit any additives in canned pineapple. The Codex standard permits natural fruit essences, mint flavour and acidifying agent in unlimited quantity and also permits the use of antifoaming agent at a level of 10 mg/kg.

Thus, the Codex standard provides processing aids to the manufacturer. Alignment of national standards with inter-

national standards on this point should help the technologists a great deal.

2.8 On the contrary, the Codex standard is least rigid with respect to contaminants. Only the tin requirement of 250 mg/kg has been stipulated. Although this limit is the same in the Indian Standard as well as in the FPO standard but the PFA Rules, *vis-à-vis* Indian Standard, prescribe the limits of additional contaminants, namely, arsenic, lead, copper and zinc. Here alignment of national standards with international standards should eliminate unnecessary expenditures on quality.

2.9 For hygienic requirements, the Codex standard refers to the international Code of Hygienic Practice for Canned Fruit and Vegetable Products. In the FPO standard no such mention has been made. An Indian Standard has been compiled, namely, IS: 6542-1972 Code for Hygienic Conditions for Fruit and Vegetable Canning Units. Implementation of this Indian Standard should enable better acceptance for product in overseas countries.

2.10 Regarding quantity of the fruit in the can, the provision in the Indian Standard and the FPO standard is that the head space shall not be more than 1.6 cm. The provision in the Codex standard is more realistic, namely the container shall be well-filled with fruit and the product shall occupy not less than 90 per cent of the water capacity of the container—a much better solution to this recurring technical problem.

2.11 Finally, the Codex standard prescribes detailed provisions on labelling with respect to the style of the product, declaration of covering medium, list of ingredients, net contents, name and address of the manufacturer/packer/distributor/importer and country of origin. Most of these requirements are given in the Indian Standard as well as FPO standard. However, for export purposes the provisions in the FPO

as well as in the Indian Standard require to be elaborated.

3. Tasks Ahead

3.1 The above would show that non-alignment of national standards with international standards in the field of processed fruits and vegetables has landed us into a situation which virtually implies that our industry is unable to apply those technical solutions which have been accepted all over the world. Acceptance of this factual position by the industry would go a long way in bridging the gap that exists between the national standards activity and international standards activity. Towards this acceptance and consequent urgent expeditious actions the following suggestions may be helpful:

- (a) Detailed comparison of the Indian Standard, FPO standard and the Codex standard on the lines given above should be attempted for all products.
- (b) Analytical data from the laboratories carrying out routine testing of products for FPO should be made available to all concerned including ISI for up-dating national standards.
- (c) Analytical data on new requirements emanating from Codex standards whose inclusion would be helpful to the industry should be compiled.

On the basis of (a), (b) and (c) national standards should be aligned fully with international standards.

- (d) Hygiene Code compiled by ISI, namely, IS: 6542-1972 should be implemented by the industry rigidly and the series of Indian Standards on storage and transport of

some fruits (*see* Appendix C) should be fully utilized by the cold stores in the country.

- (e) Restrictive list of food additives under the PFA Rules *vis-à-vis* FPO and Indian Standards should be updated on the basis of recommendations of the Codex Alimentarius Commission.

Definition of steps of Codex Alimentarius Commission

Step 1: The Commission decides on the elaboration of a world-wide *Codex standard* and decides which subsidiary body or other body should undertake the work.

Step 2: The subsidiary body or other body so designated prepares a *proposed draft standard*, taking into account the work accomplished by the appropriate international organizations. The draft is sent to the Commission's Secretariat by the Chairman of the subsidiary body or other body.

Step 3: The *proposed draft standard* is sent by the Commission's Secretariat to Member States and Associate Members of FAO and/or WHO and to the international organizations concerned in order to obtain their comments.

Step 4: The Commission's Secretariat sends the comments received from governments and from the international organizations concerned to the subsidiary body or other body concerned, which has the power to consider such comments and to amend the *proposed draft standard*, if appropriate.

Step 5: The *proposed draft standard* is submitted through the Secretariat to the Commission with a view to its adoption as a *draft standard*. The Commission may, however, refer it to a special subsidiary body, set up under Rule IX. 1 (a) of the Rules of Procedure, before adopting it as a

APPENDIX A

List of Standards issued by Codex Alimentarius Commission

Standard	Document No.	Status (Step)
Canned Tomatoes	Document CAC RS 13-1969	
Canned Peaches	" " 14-1969	
Canned Grapefruit	" " 15-1969	
Canned Green and Wax Beans	" " 16-1969	
Canned Apple Sauce	" " 17-1969	
Canned Sweet Corn	" " 18-1969	
Canned Pineapple	" " 41-1970	
Canned Mushrooms	" " 53-1972	9
Canned Asparagus	" " 56-1972	
Processed Tomato Concentrates	" " 57-1972	
Canned Green Peas	" " 58-1972	
Canned Plums	" " 59-1972	
Canned Raspberries	" " 60-1972	
Canned Pears	" " 61-1972	
Canned Strawberries	" " 62-1972	
Canned Mandarin Oranges	ALINORM 74.20, App. VII	
Raisins	" " 74.20, App. VI	
Table Olives	" " 74.21, Joint Codex ECE	
Canned Peaches—Amendment	" " 74.20, App. IV	8
Canned Tomatoes—Amendment	" " 74.20, App. V	
Canned Pineapple—Amendment	" " 72.20A, App. XI	
Canned Fruit Cocktail	" " 71.20, App. VI	
Jams (Fruit Preserves and Jellies)	" " 72.35, paras 138-141	7
Citrus Marmalade	" " 74.20, App. II	7
Canned Mature Processed Peas	" " 74.20, App. III	7
Canned Carrots	" " 74.20, App. X	5
Canned Tropical Fruit Salad	" " 74.20, App. VIII	3
Pickled Cucumbers (Cucumber pickles)	" " 74.20, App. IX	3
Canned Beans in Tomato Sauce	" " 74.20, App. XI	3
Dried Figs	" " 74.20, para 126	
Dried Apricots	" " 69.20, paras 33 and 35	
Dates	" " 70.20, para 38 (C)	
Pistachios	" " 69.20, paras 32 and 35	
Dried Currants	" " 70.20, para 38 (C)	
Canned Fruit Salad (other than tropical)	" " 70.20, para 38 (C)	
Canned Two Fruits Salad	" " 69.20, paras 32, 33 and 35	
	" " 70.20, para 38 (C)	
	" " 68.20, para 69	
	" " 70.20, para 38 (C)	
	" " 70.20, para 38 (C)	

Note: Definitions of steps is attached

draft standard or may entrust the special subsidiary body with the responsibility for undertaking Steps 5, 7 and 8 of this Procedure or any part thereof.

Step 6: The draft standard is sent by the Commission's Secretariat for comment to all Member States and Associate Members of FAO and/or WHO and to the international organizations concerned.

Step 7: The comments received from governments and from the international organizations concerned are sent by the Secretariat to the subsidiary body or other body concerned, which has the power to consider such comments and amend the draft standard, if appropriate.

Step 8: The draft standard is submitted through the Secretariat to the Commission

with a view to adoption as a *recommended standard*.

Step 9: The *recommended standard* is sent to all Member States and Associate Members of FAO and/or WHO and to the international organizations concerned. Members of the Commission notify the Secretariat of their acceptance of the *recommended standard* in accordance with the acceptance procedure laid down in paragraph 4 or in paragraph 5 of the General Principles of the Codex Alimentarius (see), whichever is appropriate. Member States and Associate Members of FAO and/or WHO that are not Members of the Commission are invited to notify the Secretariat if they wish to accept the *recommended standard*.

Step 10: The *recommended standard* will be published in the Codex Alimentarius as a world-wide *Codex standard* when the Commission determines that it is appropriate to do so in the light of the acceptances received.

APPENDIX B

LIST OF STANDARDS ISSUED BY ISO

A. Storage and Transport of Fruits

- 1. 873-1968 Peaches—Guide to Cold Storage
- 2. 931-1969 Green Bananas—Guide to Storage and Transport
- 3. 1134-1969 Pears—Guide to Cold Storage
- 4. 1212-1970 Apples—Guide to Cold Storage
- 5. 1838-1970 Fresh Pineapples—Guide to Storage and Transport
- 6. DIS 2168 Table Grapes—Guide to Cold Storage
- 7. DIS 2169 Fruits and Vegetables—Testing Physical Conditions in Cold Stores

- 8. DIS 3631 Citrus Fruits—Guide to Storage and Transport
- 9. DIS 3659 Fruits and Vegetables—Ripening After Storing by Refrigeration
- 10. DIS 1673 Onions—Guide for storage
- 11. DIS 2165 Ware Potatoes—Guide for storage
- 12. DIS 2166 Carrots—Guide for storage
- 13. DIS 2167 Headed Cabbage—Guide for storage
- 14. DIS 2169 Testing of physical conditions in cold stores
- 15. Headed cabbage, storage in open
- 16. Potatoes, storage in open
- 17. Citrus fruits, storage and transport
- 18. Garlic, cold storage
- 19. Plum, cold storage
- 20. Strawberries, cold storage
- 21. Billberries, cold storage
- 22. Tomatoes, cold storage
- 23. Green Bananas—Ripening conditions

B. Methods of Test for Fruits

- 1. 750-1968 Fruit and Vegetable Products—Determination of Titratable Acidity
- 2. 1026-1969 Fruit and Vegetable Products—Determination of Total Solids
- 3. 1842-1970 Fruit and Vegetable Products—Determination of pH
- 4. DIS 2172 Fruits and Vegetables—Determination of Soluble Solids Content—Pycnometric Method
- 5. DIS 2173 Fruits and Vegetables—Determination of Soluble Solids Content—Refractometric Method

6. DIS 3094 Fruit and Vegetable Products—Determination of Copper
7. DIS 1448 Fruit and Vegetable Products—Determination of Ethanol
8. DIS 1955 Citrus fruits—determination of essential oil content
9. Wet method for decomposition of organic matter
10. Ashing method for decomposition of organic matter
11. Determination of Copper
12. Determination of volatile acidity
13. Determination of Iron
14. Determination of chlorides content
15. Determination of benzoic acid
16. Determination of sorbic acid
17. Determination of lead
18. Determination of alkalinity of ash
19. Determination of sulphur dioxide
20. Determination of sugars (Lane and Eynon method)
21. Determination of sugars (Bertrand and Luff—Schödel method)

22. Determination of benzoic acid—colorimetric method

APPENDIX C

Indian Standards for Storage and Transport of Fruits and Vegetables

Standards Published

1. IS:3718-1968 Wooden boxes for packaging of apples
2. IS:6028-1971 Guide for storage and transport of green bananas
3. IS:6669-1972 Guide for storage of apples
4. IS:6670-1972 Guide for storage of potatoes
5. IS:7191-1974 Guide for storage of tomatoes
6. IS:7192-1974 Guide for storage of citrus fruits
7. IS:7252-1974 Testing of physical conditions in cold storage

Draft Standards in wide circulation

8. Guide for storage of pears
9. Guide for storage of peaches

JOINT FAO/WHO FOOD STANDARDS PROGRAMME CODEX ALIMENTARIUS COMMISSION

Food laws which attempted to protect the interests of consumers were perhaps among the earliest forms of legislation known to man. They have been traced back to the earliest times of civilized society. It was not, however, until the last century that the basis for national food legislation as it is known today was established in industrialized societies. By now most of the world's developed countries have complex and sophisticated national food legislations. Even so, those countries are faced with a continual need to revise their legislation to take account of technological developments. There still remains much to be done on a national level by most countries of the world. Many of the newly independent and developing countries are at this moment in the process of preparing basic food laws and introducing systems of food control for the first time. It is very much in their interest that national legislation, whilst safeguarding the interests of the local population, should not be seriously in conflict with the general requirements of the world's main markets for foodstuffs.

One might fairly ask why it is that so much attention is being given today to international food standards when so much still remains to be done on a national level to protect the consumer. It would be fair to say that the prospect of facilitating international trade in foodstuffs by the removal of non-tariff barriers to trade is perhaps the main force motivating a large number of governments, especially in those countries where the export of food constitutes an important element in their economies. This, however, is only part

of the story. An equally keen interest is being shown in the need to establish international food standards by the authorities in the importing countries who are concerned to ensure that safe and wholesome food products are sent to their countries. The two main forces behind the development of international food standards can be said, therefore, to be the protection of the health of the consumer and the need to facilitate international trade in foodstuffs.

Very little progress was made in the field of international food standards until after the second world war. Some steps were taken at the beginning of this century but these were faltering and did not lead to any real international agreement or implementation of measures such as those which are being undertaken at the present time. Several international organizations, concerned primarily with problems of better marketing, had begun to work in fields closely allied to food standards. Some notable success has been achieved, in particular by the United Nations Economic Commission for Europe and the Organization for Economic Cooperation and Development, relating to grade standards for intra-European trade in fresh fruits and vegetables. Other bodies, such as the Council of Europe (Partial Agreement), have concentrated on the public health aspects of food and have attempted to secure international agreement among the member countries of the European Economic Community (when the EEC consisted of six member countries) and Denmark, the United Kingdom and Switzerland on such matters as positive lists of food additives and tolerances for pesticide residues.

Much of the work of these bodies has been based on the views of a relatively restricted number of countries. Thus, whilst providing a valuable basis for subsequent work, it has not led to widespread harmonization of national food legislations. Preoccupation with the technical and economic problems of producing and importing sufficient food into Europe until the early 1950s was a further factor which prevented governments from embarking actively upon arrangements which would lead to uniformity of food legislation. The establishment of economic groupings such as the European Economic Community and the Council for Mutual Economic Assistance and, more recently, in Latin America and Africa, aimed primarily at creating common markets among the member countries, has stimulated interest both inside and outside these areas in the need to remove not only economic but also non-tariff obstacles to the international trade in foodstuffs. Increasing attention throughout the world has been focused on the need to reduce the non-tariff obstacles to trade as a result of the work of such bodies as the General Agreement on Tariffs and Trade and the United Nations Conference on Trade and Development to liberalize and stimulate multilateral trade through the reduction of tariffs and other economic measures.

It was against this background of rapidly increasing interest in trade problems that the Member Governments of the Food and Agriculture Organization of the United Nations (FAO) and of the World Health Organization (WHO) decided that the time was opportune to create arrangements for international action to try to remove those non-tariff obstacles to the trade in foodstuffs caused by differing national food legislations. At the same time, the Member Governments of FAO and WHO emphasized the need to ensure that proper safeguards be maintained or established for the protection of the health of the consumer. It might therefore be of

interest to recall briefly how FAO and WHO became involved in this type of activity.

FAO and WHO are relatively newcomers to the subject of international food standards. In 1958, work was begun by an FAO Committee of Government Experts, in collaboration with the International Dairy Federation, on the establishment of a Code of Principles concerning Milk and Milk Products and compositional standards for milk products. This is, in fact, an international code of conduct for the use of proper designations, definitions and fair practices in the international trade in dairy products. The Committee has gone on to elaborate compositional standards for the main milk products and also for specific commodities such as cheese varieties important in world trade. The Committee, as its work progressed, developed the following procedure which at that time was new in international circles. Having reached preliminary agreement on the technical aspects of the work, it would refer its decisions to governments for comments and then, in the light of these comments, the Committee would endeavour to finalize standards which were then presented for acceptance by governments. These arrangements have proved to be very successful. A further development which took place in 1958, and which was to prove to be of great importance to both FAO and WHO in introducing an international programme for the elaboration of food standards, was the creation of a body known as the Codex Alimentarius Europaeus. This body was set up jointly by the International Commission on Agricultural Industries and the Permanent Bureau of Analytical Chemistry. The prime mover in the creation of this body was the late Dr H. Frenzel, a former Austrian Minister. The Codex Alimentarius Europaeus soon ran into certain procedural as well as financial difficulties. Although its initial approach to food standards work was more closely akin to that followed by the German-speaking

countries, other European countries outside the immediate membership of the body began to take an interest in the need to approach the subject either on a truly regional or on a world-wide basis.

In 1961, the Council of the European Codex Alimentarius adopted a resolution proposing that the work should be taken over by FAO and WHO. From that moment matters moved quickly; the time was apparently ripe for the establishment of a wide forum in which governments from all over the world could get together to try to harmonize their various approaches to food standards questions. The governing bodies of FAO and WHO approved the establishment of a Joint FAO/WHO Food Standards Programme, the creation of a jointly sponsored body to be known as the Codex Alimentarius Commission to implement the Programme and the holding of an inaugural Conference on Food Standards in 1962 which was to lay down guidelines for the first session of the Codex Alimentarius Commission held in 1963. This briefly is the background to the birth of the Codex Alimentarius Commission. Ten years ago, when the Commission held its first session, some 30 countries, almost all of which were developed countries, were Members of the Commission. Membership has trebled since that time, and today 105 countries are Members of the Commission, some two-thirds of them being developing countries (Annexure). It can reasonably be claimed that the Commission has assumed the leading role in establishing international food standards throughout the world.

The Commission's work is motivated by two main considerations: (i) the protection of the consumer against health risks and fraud; and (ii) the need for the widest possible measure of international agreement on food standards in order to facilitate international trade. The objectives of the Commission are to develop international food

standards on a world-wide or, where appropriate, on a regional or group of countries basis, to publish these standards in a food code, the Codex Alimentarius, and to record the acceptance and implementation of these standards by governments. The Commission collaborates with a very large number of international and national bodies concerned with the elaboration of food standards in different parts of the world. One of the basic objectives of the Commission is to try to coordinate all the food standards work of international governmental and non-governmental organizations and to channel this into a meaningful but unified food code. Since the first session of the Commission in 1963, strong and valuable ties of cooperation and working relations on matters of mutual interest have been established with a very large number of organizations interested in the various aspects of food standardization. One of the principal reasons for the close collaboration which has been achieved by the Commission and other organizations is that a genuine attempt has been made to avoid any duplication of the work of the other organizations.

The Commission has embarked on an extensive programme of work covering the compositional, labelling, additive, contaminant, pesticide residue, hygiene, sampling and analytical aspects of foods. Much of this work is being carried out by subsidiary bodies of the Commission or in cooperation with other international organizations or specialized bodies. Fortunately, the Commission has not fallen into the trap which has ensnared some other bodies in similar fields in the past, namely of trying to work solely on existing national legislations and endeavouring to harmonize them without proper regard to the substance behind the laws. The Commission's approach has been different. It has set out to secure international agreement on the substance of food standards and then to invite governments to accept these stan-

dards in various specified ways. This leaves governments free to proceed in accordance with their own national and constitutional procedures and to advise the Commission as to how implementation of the standards is to be achieved in their countries. The soundness of this approach has been clearly demonstrated in the case of the FAO/WHO standards for milk products. The different ways in which a government can accept a standard adopted by the Commission, and the obligations falling on governments if it is accepted, are contained in the General Principles of the Codex Alimentarius.

The development of standards is done by subsidiary bodies known as Codex Committees. The committees can be divided into two broad groups—those dealing with general subjects, such as hygiene or labelling, which are applicable to all foods and those dealing with specific foodstuffs. A unique feature of the methods used is that responsibility for running the various Codex Committees and for piloting the standards through the Steps of the Procedure for the Elaboration of Codex Standards is undertaken by various governments which have indicated their willingness to undertake this task. The fact that many governments have been willing to incur the not inconsiderable expense of hosting Codex Committees is, in itself, a clear indication of the value and importance which these governments attach to such work. There are a number of subsidiary bodies which are not hosted by individual governments. These include two Joint UNECE/Codex Alimentarius Groups of Experts working on standards for fruit juices and quick-frozen foods, an FAO/WHO Committee of Government Experts working on standards for milk and milk products, and a Group of Experts under the joint auspices of the International Olive Oil Council and the Codex Alimentarius Commission, working on a standard for table olives. Appendix

II to this paper indicates the various subsidiary bodies which have been established by the Commission.

The Commission has developed a detailed procedure for the elaboration of Codex standards. After a draft standard has first been considered by the Committee concerned, the procedure allows for two rounds of comments by governments, two examinations by the Committee and two considerations by the Commission before the standard is formally sent to governments for acceptance. While this procedure appears to be lengthy, it has been deliberately designed to give governments the fullest opportunity to comment on standards while they are still in draft and to enable the Commission to satisfy itself that the standards are being prepared along the right lines. Any procedure for the elaboration of international standards which fails to give governments adequate time to reflect on, and to consider, the standards from all aspects would, in the long run, be self-defeating. The lack of proper procedures has been the rock on which many previous attempts to secure international agreement on food standards have foundered. Normally it takes about four to five years for a standard to be developed and adopted by the Commission.

The procedure seems to have worked well, judging by the fact that the Commission has adopted sixty-four international standards and that some twenty-seven countries have given acceptance to a number of standards in the first batch of 42 standards sent to governments for acceptance.

A great deal of progress has been made on matters which can be said to relate directly to the protection of the health of the consumer. Of particular interest are the activities of the Commission and its subsidiary bodies in respect of food additives, contaminants, pesticide residues, food hygiene and labelling.

Food Additives

The approach used internationally to the evaluation of the safety in use of both food additives and pesticides is similar in that (i) the need for their use has to be established and when established, the amounts used should be no more than is necessary to achieve the desired effect or result; and (ii) for both food additives and pesticide residues the toxicologists establish acceptable daily intakes (ADIs). Even though there is this similarity of approach it is, for reasons explained later in this paper, more difficult to reach international agreement on worldwide limits for pesticide residues than for food additives. Regarding food additives, it is not too difficult for governments to reach agreement on the maximum level of use required to achieve any particular purpose, although it is only proper to add that sometimes the justification for their use is called in question; the use of artificial colours is a good example. What has proved to be more difficult has been how to assess the total intake of a particular food additive in the diet in the absence of detailed food consumption data from countries. WHO has, however, established a computerized system by means of which an estimate is made of the potential daily intake of individual food additives. The potential daily intake, together with the acceptable daily intake (ADI) established by the Joint FAO/WHO Expert Committee on Food Additives, are necessary items of information in order to enable the Codex Committee on Food Additives to reach conclusions concerning the acceptability, from a toxicological point of view, of limits for food additives proposed by Codex Commodity Committees dealing with individual standards. The Commission scrutinizes closely all proposed uses of food additives, both from the point of view of safety as well as technological need. One of the consequences of this work has been the stimulation of research in various coun-

tries and, in particular, additional toxicological research even in the case of a number of additives which have been permitted for many years in national legislations. The Commission, in addition to having approved some 500 specific food additive provisions in Codex standards, has now established a first list of (a) additives which it considers to be safe for use in food, and (b) additives which it considers to be unsafe for use in foods. This work is of a continuing nature and the first lists will be published in 1973. Member Governments of FAO and WHO are also examining at the present time a large number of specifications of identity and purity for food additives. These specifications will, in due course, be submitted to governments for acceptance.

Pesticide residues

Pesticide residues at the international level present much more complex problems and difficult issues than food additives. Whilst the toxicological evaluation of pesticides and their degradation products remain of paramount importance, it is essential to take into full account good agricultural practices. Such practices are relative and differ from country to country in accordance with varying problems regarding pest control, infestation and climatic conditions. Other important problems are concerned with sampling and analysis of residues. The Commission is therefore making an examination of various approaches which could be followed in determining the presence of pesticide residues, the maximum levels of such residues which might be permitted in raw materials and, above all, the quantity of residue which may be safely ingested by the consumer. Sixty-six pesticides have been evaluated and tolerances have been proposed for their residues in a wide range of foods. Work in this field is likely to be of a continuing nature due to problems of pest resistance which require the formulation of new compounds as well as the in-

creasing application of agricultural chemicals throughout the world under widely varying conditions. In submitting international tolerances to the Commission for adoption, the Codex Committee on Pesticide Residues relies on the expert evaluation by the Joint Meeting of the FAO Working Party of Experts on Pesticide Residues and the WHO Expert Committee on Pesticide Residues of all available data, both toxicological and those relating to good agricultural practice. To-date, three series of Recommended International Tolerances for Pesticide Residues, covering the residues of 18 pesticides and involving some 90 specific tolerance in a wide range of foods, have been sent to governments for acceptance.

Food Hygiene

Perhaps the most difficult aspect of the Commission's work to-date has been how to tackle internationally the subject of food hygiene. The major concern of any government dealing with this subject is to establish proper arrangements which will ensure the fitness of food for human consumption. This is, of course, considerably easier to deal with nationally than internationally. The Codex Committee on Food Hygiene has held nine annual sessions. It has received much advice and assistance from other international organizations which have been working in this field for a number of years. In particular, it has received valuable background documentation from the International Commission on Microbiological Specifications for Foods (ICMSF) which was set up by the International Association of Microbiological Societies (IAMS), and also from the International Organization for Standardization (ISO). Nevertheless, in spite of the information supplied by governments and research bodies in this field, microbiological standards have proved to be a highly controversial subject from the point of view of Codex standards.

Among the Member Governments FAO and WHO there are proponents of the advantages of establishing microbiological standards for all foods. Other countries consider that microbiological standards can be practical only for a very restricted number of products and that, even in these cases, they would not justify any relaxation in plant inspection and detailed supervision of food throughout the whole chain of distribution. When these opinions are considered from an international point of view, the question arises as to how a country can determine if an imported food has been correctly prepared under proper conditions of hygiene. At first sight, the solution might appear to be the laying down of microbiological standards. Variations in methods of sampling and analysis of food, the procedures followed by various public health laboratories, the absence of agreement on microbiological tests, and the significance to be attached to their results make extremely difficult to reach any international agreement.

Although the Codex Committee on Food Hygiene intends to undertake work on microbiological end-product specifications for individual foods, the controversial nature of this subject seems to call for recommendations being obtained at an independent expert level in the first instance. Proposals have already been formulated with a view to convening, with support of the Environment Fund (Conference on Human Environment, Stockholm, 1972), Joint FAO/WHO Expert Meetings on Food Microbiology in 1973 and annually thereafter, for a number of years. In the meantime, it has been agreed that provisions in Codex standards in respect of hygiene may need to be modified whether or not they are capable of verification by the public health authorities of the importing country.

The governments participating in the work of the Codex Committee on Food

hygiene concluded that, as a first step, codes of hygienic practice should be elaborated which would be of assistance to all countries engaged in international trade in foods. Based upon the experience of the problems and difficulties which some governments have encountered in respect of imported foods, the Codex Committee on Food Hygiene has established a programme of work designed to cover those products which can present serious public health hazards.

The Committee has elaborated a Code of Practice on the General Principles of Food Hygiene and five codes of hygienic practice. These are for dried fruits, canned fruit and vegetable products, dehydrated fruits and vegetables including edible fungi, desiccated coconut and tree nuts, all of which have been adopted by the Commission. The Eighth Session of the Commission considered for adoption a code of hygienic practice for quick frozen fruits, vegetables and their juices but decided to hold this code in abeyance for the time being. The Committee on Food Hygiene is currently elaborating codes of hygienic practice for egg products, poultry processing, frozen pre-cooked foods including semi-cooked foods, molluscan shellfish and groundnuts. In addition, the FAO Fisheries Department is elaborating, in collaboration with the Committee, codes of both technological and hygienic practice for various kinds of fish and fishery products.

In general, the codes of hygienic practice deal with the raw material requirements including environmental hygiene in the growing and raw food material production areas, hygienic harvesting and production of raw food materials, transportation; processing plant facilities including construction layout, equipment and utensils; hygienic operating requirements and practices including laboratory control and other procedures; and where appropriate, end product specifications. It is hoped that

these codes will perform a useful educational rôle, especially in developing countries and may even form the basis of international agreement among countries as to the basic hygienic conditions which will have to be met to ensure that food is fit for human consumption. Requirements concerning specific methods of processing may prove to be a large part of the solution to these difficulties.

A particularly important development in comparatively recent times has been the establishment of a Codex Committee on Meat Hygiene which is developing a code of hygienic practice for fresh meat and a code of ante-mortem and post-mortem inspection of slaughter animals for human consumption.

Food Labelling

One of the most vexatious problems which the exporter of foodstuffs is likely to encounter is the wide disparity among different countries' requirements in respect of labelling. The Codex Committee on Food Labelling therefore established, as a first priority, a General Standard for the Labelling of Prepackaged Foods. This General Standard has been finalized by the Commission and sent to Member Governments for acceptance. The General Standard serves as a point of departure or model for Codex Commodity Committees in drawing up the labelling sections of individual commodity standards. By and large, the provisions in the General Standard are adhered to by the Commodity Committees but, as envisaged in the General Standard, the nature of some commodities may be such as to require or justify some departure from, or addition to, the provisions in the General Standard. The Committee is about to start work on the subject of the advertisement of food, with particular reference to claims and misleading descriptions. A further subject which the Committee will be looking into is that of nutritional labelling. The labelling of bulk

containers is also engaging the Committee's attention.

Food Control (FAO)

For some years FAO has been assisting developing countries, largely on a project basis, in establishing or strengthening the infrastructure necessary for food control at national level. Expertise has been provided for drafting basic food legislation and national food standards and advice and assistance has been made available for establishing laboratories and training laboratory and inspectorate staff and on general organization. In addition to these national food control projects, regional and sub-regional seminars on food control have been held in various parts of the developing world and others are planned for the future. The Legislation Branch of FAO has provided information on legislation in the form of various publications and research studies and has prepared draft enactments to assist Member Governments in developing countries in drawing up specific regulations.

FAO is now receiving an increasing number of requests for information, advice, guidance and assistance from developing countries which are interested in strengthening their food control services. Aware of these developments and the wish of the Commission that its international standards be accepted as widely as possible, the Director-General of FAO carried out an internal reorganization of the units of FAO concerned with food standards and food control. As a result of this reorganization, the Joint Office of the Codex Secretariat has been transferred to the Food Policy and Nutrition Division and has been located together with the Food Control Unit, in a new Service known as the Food Standards and Control Service. International food standards can be of only limited value to developing countries unless they have the means of policing them. One of the tasks of the Food Control Unit will, therefore, be

to provide, within the means available to it, advice and assistance to developing countries to enable them to be in a better position to implement the international standards adopted by the Commission. This work constitutes, therefore, very necessary back-stopping to the work of the Codex Alimentarius Commission.

WHO

Since one of the principal aims of the work of the Commission is to protect the health of the consumer, it is clear that the role of WHO for the successful implementation of the Commission's work is one of paramount importance. Although the public health aspects of the Commission's activities are mainly concentrated in the Codex Committees on Food Hygiene, Meat Hygiene, Foods for Special Dietary Uses, Food Additives, Pesticide Residues and in the supporting Expert Committees, namely the Joint FAO/WHO Expert Committee on Food Additives and the Joint Meeting of the FAO Working Party of Experts on Pesticide Residues and the WHO Expert Committee on Pesticide Residues, public health considerations affect the work of all Codex Commodity Committees because the vast majority of Codex standards contain provisions on food additives and food hygiene.

The rôles which FAO and WHO play in the furthering of the aims and objectives of the Food Standards Programme are obviously very closely connected. It might perhaps be said that the principal rôle of WHO is to provide the necessary expertise and facilities for making available to the Commission recommendations and advice designed to safeguard the health of the consumer. In addition, it might be said that WHO also has the rôle of 'watchdog' in all aspects of the Programme having to do with the safety of food and the health of the consumer.

Before the Codex Alimentarius Commission was established, WHO, in collaboration with FAO, had initiated activities on the safety aspects of food, including the convening of expert committees. The series of Expert Committees on Food Additives started in 1955 and the series of Expert Committees on Pesticide Residues started in 1961. An Expert Committee on Meat Hygiene was convened in 1954 and 1961 and an Expert Committee on Milk Hygiene was convened in 1956 and 1959.

Reference has already been made to the work of the Joint FAO/WHO Expert Committee on Food Additives and of the Joint FAO/WHO Meeting on Pesticide Residues. These Expert Committees meet at regular intervals since their work is of a continuing nature. An additional important task falling upon WHO in connection with the Commission's work is the computerized estimation of potential daily intakes of food additives and contaminants, including pesticide residues, in individual countries. This task is made difficult by the paucity of reliable food consumption data from individual countries or regions and by an almost total absence of food consumption data relating to special groups of the population, for example infants and children or people whose consumption of individual foods is significantly higher than average.

In 1967, a WHO Expert Committee on Microbiological Aspects of Food Hygiene met and this Committee formulated general principles on microbiological standards for foodstuffs. Work on the unification of procedures for the microbiological examination of foods, including sampling methods as well as microbiological specifications for a number of food products, has proceeded in collaboration with, amongst others, the International Commission on Microbiological Specifications for Foods (ICMSF). As a result of this cooperation,

it is planned to publish 'Microorganisms in Food-II. Sampling for Microbiological Analysis; Principles and Specific Applications' during 1973. In the field of microbiology, WHO supported research has been extended to cover problems associated with mycotoxins.

In 1970, an *Ad Hoc* Group of Experts convened by WHO and FAO met in Geneva to facilitate the work of the Commission on the development of a Code of Hygienic Practice for Fresh Meat. In 1971, an *Ad Hoc* Group of Experts, convened by WHO, also met in Geneva to consider a first draft of a code on ante-mortem and post-mortem inspections of slaughter animals for human consumption.

In 1969, a Joint FAO/WHO Expert Committee on Milk Hygiene met and the Committee recommended principles for the hygienic handling of milk and milk products with special emphasis on the prevention of milk-borne diseases. An informal consultation on the principles of organisation and management of food hygiene programmes was held in Geneva in 1971. The consultation made recommendations concerning the analysis of factors bearing on food hygiene, legislation, training and education, including specialization, modern systems of planning, laboratory activities, surveillance and preparation of a publication on the organisation and management of food hygiene programmes. In Kenya, where WHO sponsored courses in meat inspection have been given annually since 1966, the training of specialists in food hygiene has continued. WHO has also devoted attention to further developing post-graduate training in food microbiology, more especially with a view to responding to the needs of the developing countries.

In 1964, a Joint FAO/IAEA/WHO Expert Committee on Irradiated Food established general principles for testing irradiated food for wholesomeness and in 1969, the Committee made recommendations

on the wholesomeness of irradiated wheat, potatoes and onions.

WHO has also convened meetings of experts on nutrition jointly with FAO. In 1961, 1964 and 1966, Joint FAO/WHO expert committees dealing specifically with nutrition were convened and in 1961, 1965 and 1969, Joint FAO/WHO expert groups on calcium, vitamin and other requirements were held. Their recommendations are useful to the Food Standards Programme, especially in connection with the work of the Codex Committee on Foods for Special Dietary Uses. A Joint FAO/WHO *Ad Hoc* Expert Committee on Energy and Protein Requirements met in 1971 and the conclusions of this Committee should also be useful to the Codex Committee on Foods for Special Dietary Uses.

Other activities of WHO include cooperation with collaborating laboratories, support of certain research designed to provide information on food safety and the organization of training courses and seminars to provide public health officers of different disciplines with up-to-date information on food standardization and food legislation in general and, more specifically, on the proper handling of foodstuffs, in order to prevent food-borne diseases.

Inter-laboratory studies, supported by WHO, on methods for detection of the most important food-borne pathogens have made good progress. The Fourth Informal Consultation on Food Virology held in Geneva and Brno has reviewed the current status of the WHO Food Virology Programme which has been carried out in cooperation with research workers in Brno (Czechoslovakia), and Madison, Wisconsin (U.S.A.). A retrieval system is in preparation which will enable worldwide use of the collected data and findings. WHO has also supported research activities in various countries of the world with

respect to control of some of the most important zoonoses for which food may serve as an important vehicle for transmission to man.

As mentioned earlier, WHO's work in the field of food additives, pesticide residues and other contaminants will continue on the established regular basis. In the field of food hygiene, it is understood that WHO will hold four meetings in 1973 dealing with various aspects of this subject:

- The Fifth Informal Consultation on Food Virology;
- Study Group on Methods for Sampling and Examination of Food and Food Products for Surveillance for Food-Borne Outbreaks;
- FAO/WHO Expert Committee on Food Hygiene (Fish and Shellfish)
- Joint FAO/WHO Interregional Conference on the Control of Food-Borne Diseases. Principles of Food Hygiene and Food Standardization.

'International Standards for Drinking Water' was first published by WHO in 1958, as an aid to the improvement of water quality and treatment. The standards have been adopted in whole or in part by a number of countries as a basis for the formulation of national standards and were cited in the International Sanitary Regulations as applicable in deciding what constitutes a pure and acceptable water supply at ports and airports. In 1963, a second revised edition of the International Standards was published. Increasing knowledge of the nature and effects of various contaminants and improved techniques for identifying and determining their concentrations have led to a demand for further revision of the recommendations. Accordingly, WHO convened an Expert Committee in Geneva in March 1971 and a third edition, which

is the outcome of the Committee's deliberations, has been published. In publishing this revised edition of *International Standards for Drinking Water*, WHO hopes to stimulate further investigations of such problems as the provision of safe and potable water to all communities, the function of water quality in maintaining public health and reducing disease and the improvement of treatment processes to ensure the maintenance of high standards in water supplied to consumers. WHO recognizes that the criteria embodied in these standards cannot be considered final and that future developments may make further revision necessary.

Another WHO publication which should be of considerable interest is 'Health Hazards of the Human Environment' published in 1972. This publication has been prepared by 100 specialists in 15 countries. The publication is a wide-ranging survey of environmental hazards to human health and has been compiled for the benefit of health authorities and others concerned with environmental problems. An important part of the publication is devoted to matters concerning the contamination of food.

It will be seen from the foregoing that WHO's role is extremely important to the successful implementation of the Food Standards Programme, and it is worth noting that the Twenty-Fifth World Health Assembly has requested that WHO further intensify its participation in the Programme.

Recent Developments

Pollution of the environment is now a subject which has been brought home to the man on the street: the subject is no longer confined to scientific journals, but is expounded on radio and television, in newspaper articles and magazines. The United Nations Conference on Human Environment held in Stockholm in June 1972 has focused the attention of the world

on the environmental hazards to human health. These hazards can be present in food. The increasing complexity of modern industrial society and the wide-ranging nature of the international food trade have increased the risk of the contamination of food by chemical and biological agents. The contaminants may arise from environmental and industrial pollution, e.g. mercury, lead, arsenic; from agricultural technology, e.g. pesticides, fertilizers; and from food processing practices, e.g. nitrosamines, polynuclear hydrocarbons. In addition, some of the most dangerous food contaminants are naturally occurring, for example, fungal toxins, pathogenic microorganisms and natural toxic components of food. If any part of the food chain should become contaminated, the contaminant is likely to enter the human food supply. This presents a potential hazard to human health as well as an impediment to world trade.

The U.N. Conference on Human Environment adopted two recommendations of special interest to the Codex Alimentarius Commission. These recommendations are as follows:

Recommendation No. 78

'It is recommended that internationally coordinated programmes of research and monitoring of food contamination by chemical and biological agents be established and developed jointly by FAO and WHO, taking into account national programmes, and that the results of monitoring be expeditiously assembled, evaluated and made available so as to provide early information on rising trends of contamination and on levels that may be considered undesirable or may lead to unsafe human intakes'.

Recommendation No. 82

'It is recommended that increased support be given to the Codex Alimen-

tarius Commission to develop international standards for pollutants in food and a Code of Ethics for international food trade, and that the capabilities of the Food and Agriculture Organization of the United Nations and the World Health Organization in the field of food control be increased'.

Preliminary joint proposals for the implementation of these two Recommendations have been formulated by FAO and WHO. Recommendation No. 82 bears directly on the work programme of the Commission. The present priorities and workload of the Commission and its subsidiary bodies in the field of the chemical contamination of food reflect the wish of Member Governments to expedite and expand the work on the establishment of tolerances for pesticide residues (approved usage) and maximum limits for permitted food additives and contaminants or residues of contaminants arising, in the main, from the production and processing of foods. It will be necessary therefore, as a first step, to assess the likely scope and magnitude of the additional work of elaborating, for government acceptance in the Codex machinery, international standards for environmental contaminants in food. It is the intention to put this assessment before the Tenth Session of the Codex Alimentarius Commission (July 1974), which will recommend how best to proceed.

The question of elaborating a Code of Ethics for the International Trade in Food was briefly discussed by the Codex Alimentarius Commission at its Ninth Session. The Commission decided to refer the question of the feasibility of elaborating such a code to its Executive Committee for consideration at its next session to be held in July 1973. The Executive Committee will report to the Tenth Session of the Commission. Another development of interest is the elaboration by a Working Group within the General Agreement on

Tariffs and Trade (GATT) of a Proposed GATT Code of Conduct for Preventing Technical Barriers to Trade. The proposed Code appears to cover commodities in general, including food commodities. This subject was raised at the Ninth Session of the Commission and a number of delegations expressed the view that food should be excluded from the scope of the proposed Code. The feeling behind this view seems to be that principles and provisions which may be suitable for facilitating the freer movement of trade in non-food commodities may not be entirely suitable, or indeed even practicable, in the case of food commodities, since, amongst other things, the protection of the health of the consumer is an overriding consideration. It is understood, however, that the Agriculture Committee in GATT is to review the applicability of the proposed code to agricultural products at a later stage. The entire subject will be considered by the Executive Committee at its next session in July 1973 and the Executive Committee will report to the Tenth Session of the Commission.

It is clear that interest in the value of the work of the Codex Alimentarius Commission continues to grow. The increasing membership of the Commission, the demand for Coordinating Committees in Africa, Latin America and Asia, the recognition by the UN Conference on Human Environment of the facilities afforded by the Codex machinery in reaching international agreement, all point to this. The interest in protecting the health of the consumer and in the need to facilitate international trade are stronger today than ever. Governments now recognize fully the need to participate in the work of the Codex Alimentarius Commission and are doing so in a spirit of compromise and willingness to make concession, in order to secure international agreement. Recent acceptances of the Codex standards demon-

strate the wish of many governments to give effect to international food standards. In the long run, the Codex Alimentarius will be judged by the degree of success in achieving its primary task, namely inducing governments to accept and implement internationally agreed food standards. It is too early yet to form a judgement on this, but the indications are that governments are taking the work of the Codex Alimentarius Commission very seriously and if a reasonable degree of success is achieved, then the work of the Codex Alimentarius Commission will be of lasting value for all concerned with the international trade in food, whether they be producers, exporters, importers or consumers.

Based on the article by G. O. Kermode and H. J. McNally in F.A.O. Nutrition Newsletter of 9th March 1973. We are thankful to the Joint FAO/WHO Food Standards Programme of the Food and Agriculture Organization (FAO) and World Health Organization (WHO) for kind permission to publish the paper.

ANNEXURE

Europe

1. Austria
2. Belgium
3. Bulgaria
4. Cyprus
5. Czechoslovakia
6. Denmark
7. Finland
8. France
9. Germany, Fed Rep. of
10. Greece
11. Hungary
12. Iceland
13. Ireland
14. Israel
15. Italy
16. Luxembourg
17. Malta
18. Netherlands

19. Norway
20. Poland
21. Portugal
22. Romania
23. Spain
24. Sweden
25. Switzerland
26. Turkey
27. United Kingdom
28. Yugoslavia

North America

29. Canada
30. U.S.A.

Latin America

31. Argentina
32. Barbados
33. Bolivia
34. Brazil
35. Chile
36. Colombia
37. Costa Rica
38. Cuba
39. Dominican Republic
40. Ecuador
41. Guatemala
42. Guyana
43. Jamaica
44. Mexico
45. Nicaragua
46. Panama
47. Paraguay
48. Peru
49. Trinidad and Tobago
50. Uruguay
51. Venezuela

Africa

52. Algeria
53. Burundi
54. Cameroon
55. Central African Rep.
56. Congo, People's Rep. of
57. Egypt, Arab Rep. of
58. Ethiopia
59. Gabon

60. Gambia
61. Ghana
62. Ivory Coast
63. Kenya
64. Liberia
65. Libyan Arab Rep.
66. Madagascar
67. Malawi
68. Mauritius
69. Morocco
70. Nigeria
71. Senegal
72. Sudan
73. Swaziland
74. Tanzania, United Rep. of
75. Togo
76. Tunisia
77. Uganda
78. Upper Volta
79. Zaire, Rep. of
80. Zambia

South-West Pacific

81. Australia
82. New Zealand
83. Fiji

Asia

84. India
85. Indonesia
86. Iran
87. Iraq
88. Japan
89. Jordan
90. Korea, Rep. of
91. Kuwait
92. Lebanon
93. Malaysia
94. Oman, Sultanate of
95. Pakistan
96. Philippines
97. Qatar
98. Saudi Arabia
99. Singapore
100. Sri Lanka
101. Syrian Arab Rep.
102. Thailand
103. United Arab Emirates
104. Viet Nam, Rep. of
105. Yemen, People's Democratic Rep. of

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USED BY LEADING FOOD AND FRUIT PROCESSING UNITS ALL OVER INDIA

ASC STANDARDS—THEIR INTERPRETATION AND CONTRIBUTION TO THE DEVELOPMENT OF FRUIT AND VEGETABLE PROCESSING INDUSTRY

LT. COL. O. P. KAPUR

[*Army Headquarters, Q.M.G.'s Branch (ST7), New Delhi-110011*]

A Definition

Standardisation underlines the basic concepts of product development most efficiently and economically, and a standard is defined as a document which spells out precisely the sum total of all attributes which determine the relative level of excellence of a product offered at a reasonable price.

Fruit and vegetable products offered for sale in the civil market are subject to restrictions imposed under two mandatory laws: Prevention of Food Adulteration Act (PFA) and the Fruit Product Order (FPO) which are supposed to keep an effective check against any possible health hazard and sale of sub-standard stuff. Agmark and ISI Certification Marks can provide an extra cover to the quality conscious customers. So far as Defence Forces are concerned the quality of processed Fruit and Vegetable products assumes added importance because unhygienic and sub-standard food may cause serious implications by endangering the health of troops under operational environments which may pose a serious threat to national security and prestige.

All major countries have evolved exacting specifications for specific food requirements of their Armed Forces. In India, these specifications are known as Army Service Corps (ASC) Specifications which happen

to be the oldest food standards in the country. Food requirements, including processed fruit and vegetable products, of Defence Forces who are required to operate under adverse and hazardous environmental conditions, involving extreme heat of Rajasthan border to highly humid climate of eastern regions running through snow-clad heights of Himalayas which no army of the world have faced so far, are to be catered for under these standards.

Formulation of Standards

ASC Standards are laid down by the Director of Supplies and Transport (DST) in consultation with Technical Standardisation Committee comprising the technical representatives of various research organisations including ISI, Food Research Laboratories, Director-General of Health Services and Technical Adviser, Ministry of Agriculture, Department of Food (Army Purchase Organisation). These specifications are being constantly reviewed and revised with latest developments to bring them in line with ISI Specifications bearing in mind specific requirements of the Defence Forces, e.g. stocks accepted are to be despatched to far away places which involve rail, road as well as animal transport. The stocks are required to be preserved on long term basis because canned food is normally issued only when fresh supplies are not available or feasible.



Quality Control—A Historical Audit

Annual Defence requirements of Fruit and Vegetable products are to the tune of 7,000 tonnes. Procurement of such huge stocks as per laid down standards systematically and regularly requires an efficient system. Procurement of stocks is based on the concept of 'Acceptance Inspection' i.e., the representative sample from manufactured stocks are examined and tested to assess how far they meet various prescribed requirements. Thereby, it differentiates the acceptable stocks from those which fail to comply with the requirements laid down under the specifications. This tried and well established procedure has been found to be conclusive and is based on statistically arrived at decisions. The interests of State as well as suppliers' are further protected under two important clauses enunciated under the provisions of special terms and conditions of contract governing Defence supplies.

(a) *Right to Appeal.* Suppliers have an inherent right of preferring an appeal to the appellate authority [Director of Supplies and Transport (ST7), Army Headquarters, New Delhi] against the decision of Officers Commanding of regional Food Laboratories. At this level the duplicate samples from supplier and triplicate samples submitted by concerned laboratory are examined afresh in the context of the defect pointed out in the initial rejection. In case of minor deviations the stocks are recommended for acceptance on price reduction to be decided by the Chief Director of Purchase, Ministry of Agriculture, Department of Food (Army Purchase Organisation).

Final rejection is resorted to only when defects in the consignment under examination are found to be of serious nature involving health

hazard and adversely affecting quality of food under storage during warranty stipulation. It may be mentioned that presently adverse economic factors i.e., inflation, shortage of essential commodities, lack of effective quality control, laboratory facilities with small scale suppliers and slow industrial growth are always borne in mind so that chances of final rejection are minimised to avoid non-provisioning of urgently needed defence requirements at the right time and place.

(b) *Warranty Clause.* Under exceptional circumstances due to certain defaults on the part of supplier or representative of Inspecting authority possibility of clearance of small percentage of stocks not conforming to specifications cannot be ruled out. Such instances invariably come to the notice of Quality Control Agency by the up-to-date monitoring techniques of calling Control samples, Periodical samples, Submission of Complaint samples by consuming units and by conducting spot survey checks. In accordance with the warranty clause laid down under conditions of contract it becomes obligatory on the part of supplier to take back the defective stocks with liability to pay back the cost including transportation and other charges. Furthermore, tenderings of such suppliers are closely watched to avoid any further instance of similar nature.

Acceptance inspection is essentially a post-mortem or a historical audit. It can only bring out whether a food product is good or bad. It cannot by itself change defective products into good ones. From the view point of a supplier, at times, it is considered a passive activity of finding

fault with the goods manufactured after putting in great labour and incurring lot of expenditure. On the other hand Inspecting authorities have got their own commitments and responsibilities towards the consumers whose interests they are required to look after as a part of their duty. Constructive approach to this complex problem lies in close co-operation between Industry and Inspecting authorities. The modern concept of standardisation lays more emphasis on preventing production of defective stores by stage-wise quality control than on branding them as defective ones as a finished product. ASC Standards which are quite comprehensive should be utilised as a guide by the manufacturers for purchase of raw material, processing activities and packaging of finished product. This can totally eliminate the chances of possible rejection of finished goods and relieve the appellate authorities of unnecessary load of unproductive activity and the same efforts can be channelised in helping the Industry in providing constructive collaborative suggestions on the Research and Development front through Central Food Technological Research Institute, Mysore and its regional research stations throughout the country.

It is worth-while to mention that there is a simplified procedure laid down for ISI marked products having similar ASC Specifications where stocks tendered by the Defence suppliers are straightway despatched after drawing samples without awaiting verdict of analysis which is conducted afterwards. In case stocks are found to be of not acceptable quality, the supplier has the liability to take back the stocks and return the money or replace the stocks with that of acceptable quality, including transportation charges. Similar procedure can be considered for processed fruit and vegetable products if stocks are subjected to guarantee by ISI/FPO authorities, as a trial measure.

Defence Contribution towards Development of the Industry

Improvement of traditional products, introduction of new items contributes important factor in the development of industry. Indian processed fruit and vegetable industry has achieved considerable success in this direction by meeting all defence requirements of processed food which in earlier years was imported from foreign countries. Army Purchase Organisation and Food Inspection Organisation both agencies who are vitally responsible for fulfilling the food requirements of Defence Forces have always well contributed towards these efforts of industry by providing necessary incentive. A few specific examples in support of statement are cited in the succeeding paragraphs.

Most of the manufacturers licensed under FPO are capable of producing canned fruits and vegetables conforming to ISI standards and similar National and International standards. Based on the published data available approximately 80 per cent of their production is lifted for the consumption of the Defence Forces.

Canned Guava in syrup was first introduced in the Defence Forces during 1950s in a big way due to abundance of vitamin C contents in the canned fruit. Initially manufacturers failed to produce good quality product due to failure encountered in controlling non-enzymic browning. Despite difficulties in producing quality stuff the item was not deleted from the list of approved fruits under the specification. Consequently as a result of commendable work conducted, National Food Laboratories coupled with incentive kept open by ASC standards, only canned guava but various other guava products with excellent export potential have almost reached stage of perfection.

Canned curried vegetables (Indian style)

developed by the industry form an important item of Defence Rations. Initially it was thought that curried products may have shelf-life similar to canned vegetables in brine. It has been observed on prolonged storage trials that shelf-life of curried product is in no way less than that of canned vegetables in brine provided stored under normal conditions. A similar product meat curried, developed on the same line, is a very popular delicacy among the troops. The curried products are capable of getting good support in the West Indian Markets and should serve as a boon to Indians residing abroad.

There is a laid down procedure to give technical advice on ASC standards in case of new Defence suppliers in that they can send advance samples through Chief Director of Purchase, so that any defect

noticed can be pointed out to them well in advance with a view to enable them to manufacture supplies in accordance with the laid down standards.

Food Inspection Organisation assures full co-operation to the industry in introduction of new products for the Forces. Initially efforts should be made to introduce them in the Defence Canteens and new products of exceptional nutritional importance, on approval of Quartermaster General, Army Headquarters, can be subjected to consumer trials and consequently covered by ASC standards in due course. Samples of such products can be forwarded to Army Headquarters Food Laboratory for quality assessment and advice through Chief Director of Purchase of Army Purchase Organisation in the Ministry of Agriculture, Department of Food.

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QUALITY CONTROL OF FRUIT PRODUCTS

DAYA NAND

*[Director (F and V P), Ministry of Agriculture and Irrigation,
Department of Food, New Delhi]*

During Second World War several Fruit and Vegetable Preservation Units were set up to meet the increased demand of canned and dehydrated fruits and vegetables; jams and marmalades; tomato products; squashes and vinegar, on account of stoppage of imports. A survey of the units engaged in the manufacture of Fruit and Vegetable products was conducted by the Ministry of Agriculture. It was noticed that the factories were not maintaining minimum standard of hygiene, sanitation and quality control. A few units were selling adulterated and sub-standard products and were using high dose of additives and non-food colours.

Fruit Products Control Order was issued in 1945 under Defence of India Rules to regulate production of canned and preserved fruit and vegetable products. The Order laid down specifications for various products and a statutory provision was made for taking out licence to manufacture Fruit Products. The objectives were to improve the quality through technical guidance, extension services and enforcement of the control Order. Qualified Food Technologists were appointed, samples of Fruit Products were collected from the factories as well as markets and got analysed. Products found non-conforming to the specifications and unfit for human consumption were detained and destroyed. The enforcement of Fruit Products Order was de-centralised in 1949. Many State Governments did not appoint

adequate staff for the implementation of the Order; the enforcement was again taken over by the Government of India in 1952. The Fruit Products Order was amended in 1955 and issued under Section 3 of the Essential Commodities Act.

On the recommendations of the Central Fruit Products Advisory Committee, a scheme for continuous preshipment inspection of Fruit Products was launched for export items to ensure that only good quality raw materials are used and the products are manufactured in accordance with the FPO/buyers specifications. Qualified Food Technologists are posted in factories engaged in the manufacture of Mango Slices, Pulp, Juice and Nectar; Pineapple Slices, Juice and Pulp and other export products. Samples are drawn and tested in approved laboratories conforming to FPO/buyers specification. The quality certificates are issued for conforming products. This scheme, runs on the pattern of the continuous service Scheme in U.S.A. and Australia, has created confidence in the foreign buyers and resulted in stepping up the export of fruit products. In order to avoid delay in issue of Quality Certificate, arrangements have been made for analysis of samples at CFTRI Experimental Station in Bombay and Jadavpur University, Calcutta.

During the Fifth Five-Year Plan it is proposed to appoint additional staff for enforcement of Fruit Products Order and quality control on export of Fruit

products. The number of samples of fruit products to be analysed in different laboratories will go up to 10,000 per year.

The department has started a consultancy cell to help in the preparation of Techno-economic feasibility reports for efficient running of Fruit and Vegetable Processing Industry and in establishing

new units. The cell also helps in suggesting proper marketing strategy for procurement and distribution. The cell consists of experts in the field of Processing, Engineering and Marketing.

The cell has prepared project reports for Assam and Himachal Pradesh Agro-Industries Corporations.

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THE FRUIT PRODUCTS ORDER 1955



(As amended upto 31st December 1974)

S.R.O. 1032—In exercise of the powers conferred by Section 3 of the Essential Commodities Act, 1955 (10 of 1955), the Central Government hereby makes the following Order, namely:

1. (1) This Order may be called the Fruit Products (Second Amendment) Order 1955
(2) It extends to the whole of India.
2. In this Order, unless the context otherwise requires,
 - (a) 'The Act' means the Essential Commodities Act, 1955 (10 of 1955);
 - (b) 'Committee' means the Central Fruit Products Advisory Committee constituted by the Central Government under clause (3);
 - (c) 'Form' means a Form set forth in the First Schedule;
 - (cc) 'fruit nectar' means a ready-to-serve beverage prepared from pulp or juice extracted from fully ripe and sound fruits;
 - (d) 'Fruit Products' mean any of the following articles, namely:
 - (i) Synthetic beverages, syrups and sharbats;
 - (ii) Vinegar, whether brewed or synthetic;
 - (iii) Pickles;
 - (iv) dehydrated fruits and vegetables;
 - (v) squashes, crushes, cordials, barley water, barrelled juice and ready-to-serve beverage, fruit nectar or any other beverages containing fruit juices or fruit pulp;

- (vi) jams, jellies and marmalades;
 - (vii) tomato products, ketchup and sauces;
 - (viii) preserves, candied and crystallised fruits and peels;
 - (ix) chutneys;
 - (x) canned and bottled fruits, juices and pulp;
 - (xi) canned and bottled vegetables;
 - (xii) frozen fruits and vegetables;
 - (xiii) sweetened aerated waters with or without fruit juice or fruit pulp;
 - (xiv) fruit cereal flakes;
 - (xv) Any other unspecified items relating to fruits or vegetables.
- (dd) 'Label' means a display of written, printed, lithographed, perforated, stencilled, embossed or stamped matter on the container of any fruit product;
 - (e) 'Licensee' means a manufacturer to whom a licence is granted under the Order;
 - (f) 'Licence number' means the number of a licence granted to a manufacturer under this Order;
 - (g) 'Licensing Officer' means the Director (Fruit and Vegetable Preservation), Food and Nutrition Board, Department of Food, Ministry of Agriculture, Government of India and includes any other officer empowered in this behalf by him with the approval of the Central Government;

- (h) 'Manufacturer' means a person engaged in the business of manufacturing fruit products for sale and includes any person who obtains fruit products from another person and packs or labels them for sale;
- (i) 'Schedule' means a Schedule annexed to this order;
- (j) 'Sharbat' means any non-alcoholic sweetened beverage or syrup containing not less than 10 per cent fruit juice or flavoured with non-fruit flavours, such as rose, khus, kewra, etc;
- (k) 'Synthetic beverage' means any sweetened non-alcoholic or non-aerated beverage, plain or aerated, containing no fruit juice or having juice content less than 10 per cent, with or without artificial flavour and colour;
- (l) 'Synthetic syrup' means any non-alcoholic syrup containing less than 25 per cent fruit juice and having artificial flavour and colour resembling fruit;
- (m) 'Term' means a calendar year or part thereof ending on the 31st day of December of that year.
- 3: (1) As soon as may be after the commencement of this Order, and thereafter at the interval of every two years, the Central Government shall, by Order published in the Official Gazette, constitute a Committee, to be called the Central Fruit Products Advisory Committee, which shall consist of the Joint Secretary to the Government of India in the Department of Food who shall be the Chairman of the Committee, the Executive Director, Food and Nutrition Board, Department of Food, who shall be the Vice-Chairman of the Committee and the following members (a to f) nominated by the Licensing Officer;
- (a) one representative of the synthetic syrup, vinegar, murabba, chutney and pickle manufacturers;
- (b) one representative of the squash and ready-to-serve beverage manufacturers;
- (c) two representatives of the manufacturers of canned fruits, canned vegetables, jams, jellies, marmalades and tomato products;
- (cc) one representative of the small scale manufacturers of murabba, chutney and pickles;
- (ccc) one representative of the small scale manufacturers of canned fruits, canned vegetables, jams, jellies and marmalades;
- (d) two persons possessing, in the opinion of the Licensing Officer, suitable technical qualifications with regard to the manufacture of fruit products;
- (e) one representative of the exporters of fruit and vegetable products;
- (f) two representatives of fruit and vegetable growers in India;
- (g) the Director, Central Food Technological Research Institute or his nominee;
- (h) the Agricultural Commissioner to the Government of India or his nominee;
- (i) the Technical Adviser to the Ministry of Food and Agriculture or his nominee;
- (ii) one representative of the Ministry of Health and Family Planning (Department of Health);
- (iii) two representatives of the manufacturers of sweetened aerated waters with or without fruit juice or fruit pulp;
- (iv) One representative of the Indian Standards Institution.

Member Secretary

- (i) the Director (Fruit and Vegetable Preservation) in the Department of Food.

3: (2) A member of the Committee shall hold office for the period for which the Committee has been constituted.

Provided that a member may resign his office by notice in writing given to the Licensing Officer.

3: (3) 'If a vacancy occurs by death, resignation, efflux of time or otherwise in the office of any nominated member of the Committee, the vacancy so caused shall be filled by nomination under sub-clause 3(1), and any person appointed to fill a casual vacancy shall hold office so long only as the member in whose place he is nominated, would have held office'.*

3: (4) The quorum of the Committee shall be five but subject thereto, the Committee may act notwithstanding any vacancy in its number.

3: (5) The Committee may regulate its proceedings in such manner as it thinks fit but on any matter on which the votes of the Committee are equally divided, the Chairman or the person presiding at the Committee shall have a second or casting vote.

3: (6) The functions of the Committee shall be to advise the Department of Food in the Government of India on any matter pertaining to Fruit Preservation Industry.*

3: (7) The Central Government may, at any time, if it so deems expedient in the public interest, by order, dissolve the Committee and thereupon

the Committee shall stand dissolved and all the persons 'nominated' to the Committee shall cease to be members thereof with effect from the date of the order;

Provided that the Central Government shall take steps to reconstitute the Committee as soon as possible in the manner provided in sub-clause 3 (1).

4: (1) No person shall carry on the business of a manufacturer except under and in accordance with the terms of an effective licence granted to him under this Order in Form 'B'; nor shall he make use of the number of a licence issued under this Order on labels of non-fruit products;

4: (2) A licence shall, unless sooner cancelled, be in force for such period as may be specified therein.*

4: (3) An application for renewal of a licence shall be submitted to the Licensing Officer at least one month before the expiry of the period of validity of the licence.

4: (4) If an application for the renewal of a licence is made one month before the expiry of the period of validity of the licence, the licence shall continue to be in force until orders are passed on the application.

5: (1) Every application for the grant of a licence under clause 4:(1) shall be made in duplicate to the Licensing Officer in Form 'A' and shall be accompanied by a fee of such amount as is appropriate to each of the class of licence for which such application is made under the provision of sub-clause 5:(2).

5: (2) The following fees being appropriate fees shall be payable for one

term or part thereof under sub-clause 5:(1), namely:

	Rs.
(a) Home scale	100
(b) Cottage scale	250
(c) (i) Small Scale-Category (A)	400
(ii) Small Scale-Category (B)	600
(d) Large Scale	1500
(e) Relabeller	500

5: (2) (a) 'A manufacturer using different premises for the manufacture of fruit and vegetable products shall take out a separate licence in respect of each of such premises. A common licence number prefixed with the abbreviation of the name of the place of location of the head office of the business and suffixed with a serial number shall be issued in respect of every such premises and this shall be exhibited on the label affixed to the container of such products'.

5: (3) Any fee paid by any applicant for a licence under this clause shall not be refundable. Provided that where the licence is refused under sub-clause 4:(1) or where the licence fee paid is in excess of the amount payable for the licence granted, the licence fees or as the case may be, the excess amount paid shall be refunded to the applicant.

5: (4) The Licensing Officer may by order, for reasons to be recorded in writing, refuse to grant a licence to any applicant and shall furnish him as soon as possible with a copy of the order so passed.

6: (1) The Licensing Officer may, after giving the manufacturer an opportunity to show cause and after giving him three months' notice, cancel any licence granted to him under this Order for any breach of the terms of the licence or for any contravention of the provisions of this order or for any failure to comply with any order, direction or requisition made under this order.

6: (2) The manufacturer may appeal to the Central Government against any order passed by the Licensing Officer under sub-clause 6: (1) cancelling the licence within a period of thirty days the receipt of the order by such manufacturer and the decision of the Central Government shall be final.

7. Every manufacturer shall manufacture fruit products in conformity with the sanitary requirements and the appropriate standard of quality and composition specified in the Second Schedule to this Order. Every other fruit and vegetable product not so specified shall be manufactured in accordance with the standard of quality and composition laid down in this behalf by the Licensing Officer.

8: (1) Every manufacturer shall, in regard to the packing, marking and labelling of containers of fruit products, comply with the following requirements, that is to say:

8:1 (a) Every container in which any fruit product is packed shall bear such label as may, from time to time, be approved by the Licensing Officer and different labels may be approved for different fruit products and a manufacturer in packing such container shall use a label which is for the time being approved by the Licensing Officer.

8:1 (b) When a bottle is used in packing any fruit products, it shall be so sealed that it cannot be opened without destroying the licence number and the special identification mark of the manufacturer to be displayed on the top or neck of the bottle. The licence number of the manufacturer shall also be exhibited prominently on the side label on such bottle.

8:1 (c) When a tin, barrel or other container is used in packing any fruit product, the licence number of the manufacturer shall either be exhibited prominently on the side label of such tin or be embossed prominently thereon.

8:1 (d) Each container in which any fruit product is packed shall specify a code number indicating the lot or the date of manufacture of such fruit product. The code number shall be legible and shall be given in English or Hindi numerals or alphabets or in both. Before the issue of a licence each code number to be used by a manufacturer shall be registered with the Licensing Officer and no change shall be made therein except with the previous sanction of the Licensing Officer.

8:1 (e) The labels should not contain any statement, claim, design or device which is false or misleading in any particular concerning the fruit products contained in the package or concerning the quantity or the nutritive value or in relation to the place of origin of the said fruit products.

8:1* (f) The fruit products packed by a manufacturer shall be either those manufactured by him or those obtained from another licensed manufacturer.

8: (2) Without prejudice to the generality of the provision contained in sub-clause 8:1(1), the Licensing Officer may by order publish in the official Gazette, specify the requirements in regard to the packing, marking and labelling of containers of fruit products of any specified type or description, whether such fruit products are manufactured in India or not and every manufacturer or any person for the time being acting on his behalf shall be bound to comply with the provision of such order.

9. Every manufacturer shall submit by the 31st of January of each year to the Licensing Officer a return in duplicate in Form 'C' in respect of each class of fruit products manufactured, sold and exported by him during the previous term.*

9:(A) Every manufacturer who is not paying Excise Duty shall maintain up-to-date accounts in Form 'D' and Form 'E' in respect of receipt of different raw materials,

their consumption in the manufacture of fruit and vegetable products and disposal of the processed foods.

10. No person shall sell, or expose for sale or despatch or deliver to any agent or broker for the purpose of sale, any fruit product which do not conform to the standards of quality and composition specified in the Second Schedule or which are not packed, marked and labelled in the manner laid down in this Order:

'Provided that the provisions of Clause 8 with regard to packing, marking and labelling shall not apply to products imported from outside the country'.

11: (1) Any beverage which does not contain at least twenty-five per cent of fruit juice in its composition shall not be described as a fruit syrup, fruit juice, squash or cordial or crush and shall be described as a synthetic syrup.

11: (2) Synthetic vinegars, beverages, syrups, sharbats and other products associated with fruits and vegetables shall be clearly and conspicuously marked on the label as '*Synthetic*'. The word '*Synthetic*', wherever used, shall be as bold and in the same size and colour of the letters as are used for the name of the product and shall immediately precede such name. No container containing any such product shall have anything printed or labelled on it which may lead the consumer into believing that it is a fruit product. Neither shall the word 'FRUIT' be used in describing such a product nor shall it be sold under the cover of a label, which carries the picture of any fruit.

11: (3) Sweetened aerated waters containing no fruit juice or fruit pulp or containing less than 10 per cent of fruit juice or fruit pulp shall have a clear and conspicuous marking on their label to the effect 'Contains no fruit juice or fruit pulp'. In case artificial flavour has also been used, the words 'ARTIFICIALLY FLAVOURED' shall also be

added. The publicity and advertisement made for sweetened aerated waters through any media shall also conspicuously explain and display the fact that these products do not contain any fruit juice or fruit pulp.

12. Every manufacturer to whom any direction or order is issued in pursuance of any provision of this Order shall be bound to comply with such direction or order and any failure on the part of the manufacturer to comply with such direction or order shall be deemed to be a contravention of the provision of the Order.

13. The Licensing Officer or any Officer authorised by him in this behalf may with a view to securing a compliance with this Order:

13: (a) require any person to give any information in his possession with respect to the manufacture and disposal of any fruit products manufactured by him;

(b) enter upon and inspect the premises of any licensee or manufacturer at any time* with a view to satisfying himself that the requirements of this Order are being complied with; and—

13: (b) (i) on giving a proper receipt, seize or detain any fruit products manufactured, marked, packed or labelled otherwise than in accordance with the provisions of this Order or suspected to be manufactured, marked, packed or labelled in contravention of the provisions of this Order;

13: (b) (ii) seize or detain, on giving a proper receipt, raw materials, documents, account books or other relevant evidence connected with manufacture of fruit products in respect of which he has reason to believe that a contravention of the Order has taken place;

13: (b) (iii) dispose of all fruit products or raw materials, so seized or detained in such manner as he deems fit;

13: (c) during one term, inspect any books or other documents of a licensee relating to the manufacture and disposal of fruit products;

13: (d) collect, on payment, samples of fruit products intended or exposed for sale, or sold, or under despatch or delivery to any dealer, agent or broker for the purpose of sale and have such samples analysed at a laboratory selected for the purpose by the Licensing Officer;

13: (e) collect, from the licensee or manufacturer, free of charge, on giving a proper receipt, samples of any fruit products or any chemical, dye or any other ingredients used in the preparation of such fruit products from the premises of such licensee or manufacturer, in respect of which he has reason to believe that a contravention of the Order has taken place;

13: (f) by an order in writing prohibit the sale or manufacture of any fruit products in respect of which he has reason to believe that a contravention of this Order has taken place* 'at the dealers' as well as at the manufacturers' end'.

14. No person shall refuse to furnish any information which he is legally bound to furnish and which may be lawfully demanded of him under the provisions of this Order, or cancel, destroy, mutilate or deface any book or other document with a view to evading the provisions of this Order.

15. No prosecution for contravention of any of the provisions of this Order shall be instituted without the previous sanction of the Licensing Officer.

16. Nothing in this Order shall be deemed to apply to any syrups which

16: (i) (a) contain fruit juices for medicinal use,

16: (i) (b) are prepared in accordance with the allopathic, ayurvedic, unani or any other system of medicine, and

16: (i) (c) are sold in bottles bearing a label containing the words 'For medicinal use only' which does not exhibit any picture of fruits, and

16: (ii) to any fruit products manufactured by a person in any non-municipal

areas in quantities not exceeding one hundred kilograms during a term,

16: (iii) to any fruit products produced by institutions, colleges and training centres for demonstration and training purposes and not for sale on commercial basis,

16: (iv) to any aerated beverage manufactured without motive power'.

THE FIRST SCHEDULE

FORM 'A'

See clause 5 (1)

Application for Licence under the Fruit Products Order, 1955

1. Name and address of the applicant.
=1. (A) Names of the managing director, directors, proprietors, partners etc. =
2. Address of the factory/firm.*
2. (A) Address of godowns/stores of finished products.
3. Description of the fruit products which the applicant wishes to manufacture/relabel.*
4. Period for which the licence is required.
5. Plan of the factory and list of equipments.
6. (a) Whether any power is used in manufacture of fruit products. If so, state the exact Horse Power used.
(b) Installed capacity per 8 hours shift.
7. Licence fee paid during the previous year.
8. Total value of fruit products manufactured/relabelled* during the previous year.
9. I/We hereby undertake to comply with all the provisions of the Fruit Products Order, 1955.
10. I/We have forwarded a sum of Rupees.....in respect of the licence fee due according to the provisions of Fruit Products Order, 1955.

*Strike out whichever is inapplicable.

Signature(s) of the applicant(s)

FORM 'B'

(See clause 4)

**GOVERNMENT OF INDIA, MINISTRY OF AGRICULTURE
(DEPARTMENT OF FOOD), (FOOD AND NUTRITION BOARD)**



Licence under Fruit Products Order, 1955

Licence No. FPO.....

1. Name and address of licensee.
2. Address of authorised premises for manufacture/relabelling.*
3. Change of premises, if any.

This licence is granted under and is subject to the provisions of FPO, 1955, all of which must be complied with by the licensee.

Place.

Date.

Licensing Officer

DIRECTOR (Fruit and Vegetable Preservation)
Department of Food.

Validation and renewal

Period of validity	Items of fruit products authorised to		Category of licence	Licence Fee paid	Signatures of Licensing Officer
	manufacture	relabel			

FORM 'C'

(See clause 9)

1. Name and address of licensee.
2. Address of the authorised premises for the manufacture of fruit products.
3. F.P.O. Licence No.

Statement showing quantities of fruit and vegetable products manufactured in kgms. with their sale value during the term.

Sl. No.	Name of the fruit product	Size of can or bottle	Quantity in kgms.	Sale price per kgm. or per unit of packing	Value
1	2	3	4	5	6

Quantity exported (in kgms.)	Name of the country or port of export	Rate per kgm. or per unit of packing C.I.F./F.O.B.	Value	Remarks
7	8	9	10	11

Signature of the Licensee

* A register in the form of the above table shall be maintained by each licensee for inspection

FORM 'D'

(See clause 9 A)

Daily Production Register

(Separate pages for different categories of products)

Sl. No.	Date	Name of the product manufactured	Essential raw-materials used fruit vegetable			Sugar in Kgs.	Other materials like citric acid, pectin consumed
			Name of fruit, veg.	Qty. taken Kgs.	Prepared material Kgs.		
1	2	3	4	5	6	7	8

Qty. of products manufactured			Reference Stock Register		Remarks
Size of pack	No. of units	Kgs.	Date	Entry	
9	10	11	12	13	14

FORM 'E'

(See clause 9 A)

Stock Register

(Separate pages to be allotted for different items of fruit products)

Date	Stock in hand Kgs.	Receipts			Total stocks Kgs.
		Particulars of receipt (reference Production Register)		Stocks received Kgs.	
		Date	Entry		
1	2	3	4	5	6

Disposal		Balance Kgs.	Remarks
Stock disposed Kgs.	Particulars of disposal (Invoice/Cash Memo No. with date)		
9	10	11	12

THE SECOND SCHEDULE

(See clauses 7 and 10)

PART 1 (A)

Sanitary Requirements of a Factory manufacturing Fruit Products

The place, where any fruit products are manufactured (herein-after referred to as the factory), shall comply with the following requirements and in the opinion of the Licensing Officer shall be fit for manufacturing the item or items for which the licence is granted to the manufacturer.

1. The premises shall be clean, adequately lighted and ventilated and shall be cleaned, if required, by lime washing or colour washing or painting or disinfecting or deodourising.

2. Windows, doors and other openings suited to screening shall be fly-proof. The doors should have springs so that they may close automatically.

The ceiling or roof shall be of permanent nature. The floor should be cemented, tiled or laid in stone.

3. The equipments and the manufacturing premises approved for the manufacture of fruit products shall not be used for the manufacture of other products repugnant to the manufacture of fruit products except under the conditions given as under :

If the licensed premises are used for the manufacture of both fruit products and fish, meat and egg products there shall be a gap of at least one month when the change is made from fish, meat and egg products to the fruit products.

Explanation

The proposed date of change over from production of the fish, meat and egg products to that of the fruit products, shall be intimated to the concerned Regional Officer in writing and in case of outstation factories, the intimation shall have to be given by a registered letter.

4. The premises shall be located in a sanitary place and free from filthy surroundings.

5. All yards, outhouses, stores and all approaches of the premises shall be kept clean and sanitary.

6. The authorised premises shall be so constructed or maintained as to permit hygienic production and all operations in connection with preparing or packing of products shall be carried out carefully under strict sanitary conditions laid down in the Factories Act, 1934, as amended and modified from time to time. +The premises shall not be used as or communicate directly with the residential premises+.

7. Equipment and machinery when employed shall be of such design which will permit easy cleaning. Adequate arrangements for cleaning of containers, tables, working parts of machinery etc. shall be provided.

8. No vessel, container or other equipment, the use of which is likely to cause possible contamination infection to health shall be employed in the preparation, packing or storage of food. Copper or brass vessels shall be always kept cleaned. No unauthorised person shall come in contact with food products.

9. The water used in the manufacture shall be potable and if required by Licensing Officer shall be got examined chemically and bacteriologically by recognised laboratory. The manufacturer will bear the cost of such analysis.

10. There should be efficient drainage system and there shall be adequate provisions for disposal of refuse.

11. Whenever five or more employees of either sex are employed, a suitable number of latrines for each sex in number shall be provided.

Number of workers	No. of latrines	No. of each basin
Up to 25	1	1
25 to 45	2	2
50 to 100	3	3
100 and above	4	4

12. Whenever working is done on open fire, proper arrangements shall be made for control of smoke and dust.

13. No person suffering from infectious or contagious disease shall be allowed to work in the factory. Arrangements shall be made to get all the workers engaged in the manufacture of food products medically examined once in a year to ensure that they are free from infectious, contagious and other diseases. A record of these examinations signed by a Registered Medical Practitioner shall be maintained for inspection.

The workers engaged in manufacture of food products shall be inoculated against the common group of diseases and vaccinated against smallpox once a year to ensure that they shall be kept for inspection.

In case of epidemic all workers should be inoculated or vaccinated.

14. The workers working in processing and preparation shall be provided proper aprons and headcloths which shall be clean. The management shall see that workers are neat, clean and tidy.

PART V (B)

The factories will be categorised as under :

- (a) Large scale—factories with installed capacity of more than one metric ton of food products per day or having total annual production of more than one metric ton.

(b) *Small scale*—factories with installed capacity upto two metric tonnes of fruit products per day and total annual production of more than 50 metric tonnes and not exceeding 250 tonnes.

(c) *Cottage scale*—factories with total annual production of fruit products of more than 10 tonnes but less than 50 tonnes.

(d) *Home scale*—factories with total annual production of fruit products except canned vegetables not exceeding 10 metric tonnes.

Small scale factories shall further be grouped into (A) and (B) categories detailed as under:

Category (A) factories licensed for manufacture of fruit products with installed capacity not exceeding one metric tonne per day and annual production ranging over 50 metric tonnes to 100 metric tonnes.

Category (B) factories licensed for manufacture of fruit products with installed daily capacity not exceeding two metric tonnes with annual production ranging from over 100 metric tonnes to 250 metric tonnes.*

The licences under categories mentioned above shall comply with the following requirements:

ter

Every licensee shall arrange for at least one kilolitre per day of potable water and availability shall be adequately increased as per production. Free flowing pipe water supply shall be made available in the processing hall.

Storage Space Requirements:

Adequate space shall be provided for storage of fresh fruits, vegetables, finished products and other raw materials.

Minimum area of manufacturing premises excluding store and office space

(1) Home Scale	...	25 sq. metres
(2) Cottage Scale	...	60 " "
(3) Small Scale	...	
(i) Category (A)	...	100 " "
(ii) Category (B)	...	150 " "
(4) Large Scale*	...	300 " "

*(Area occupied by machinery shall not be more than 50 per cent of the manufacturing area).

TECHNICAL STAFF AND LABORATORY REQUIREMENTS

Large Scale:

The manufacture of fruit products shall be supervised by a chemist who should possess one of the following qualifications:

- (a) B.Sc. (Tech.) with food technology or chemical engineering with at least one year experience in a fruit preservation factory.
- (b) B.Sc. with post-graduate diploma in fruit technology from a recognised institute or diploma in fruit preservation by Kalamassery Polytechnic or Kerala Government Polytechnic.
- (c) B.Sc. with Chemistry or Agriculture as one of the subjects and three years practical experience in a fruit and vegetable preservation factory.

The factory shall have a well-equipped laboratory with 20 sq. metres floor area with adequate facilities for analysis of fruit products in accordance with the specifications laid down under the second schedule of this order.

Small Scale:

The manufacture of fruit products shall be supervised by a person possessing one of the following qualifications:

- (a) B.Sc. with Chemistry or Agriculture as one of the subjects.
- (b) A Diploma or a Certificate in fruit preservation of a course of at least three months duration, from a recognised institute.

Minimum requirements in respect of machinery and equipment:

Sl. No.	Operation	Cottage and Small Scale	Large Scale
1. (a)	Washing of raw materials	Two rectangular cement or aluminium metal tanks with false bottom. Dimensions: 1 x 0.75 x 0.75 metres	Three or more rectangular cement or aluminium tanks with false bottom. Dimensions: 1 x 0.75 x 0.75 metres or a washing machine
	(b) Washing of bottle	1. Bottle washing machine 2. Racks for holding bottles	1. Bottle washing machine 2. Trallses for holding and conveying bottles

Sl. No.	Operation	Cottage and Small Scale	Large Scale
2.	Preparation of fruits and vegetables	1. Table with aluminium or stainless steel or non-corrosive material top of 5 sq. metres area 2. Stainless steel peeling, slicing, trimming and coring knives 3. Where wooden vats or cemented tanks are used for curing and leaching these should be suitably covered 4. Not less than 12 aluminium or stainless steel trays	1. Table with aluminium or stainless steel or non-corrosive material top of 10 sq. metres area, adequate conveyer belt 2. Stainless steel coring, cubing and cutting machine/equipment 3. Wooden vats or cemented tanks for curing and leaching with suitable cover 4. Not less than 50 aluminium or stainless steel trays
3.	Juice Pulping and Mixing	1. Juice extractor and or basket press or rosin equipment 2. Stainless steel or aluminium sieve 3. Aluminium or stainless steel drum of not less than 100 litres capacity 4. Stainless steel or aluminium buckets 5. Pulper for tomato products and mango pulp	1. Power driven extractor or hydraulic press 2. Pulping machine 3. Non-corrosive stainless steel tanks having total capacity of not less than 500 litres
4.	Heat Processing	1. Boiler with steam jacketed kettles, or gas cooking 1 (a) Bhathis with soft coke or any other fuel having proper arrangement for the outlet of smoke 2. Thermometers and hydrometers	1. Boiler 2. Steam jacketed Kettles

Sl. No.	Operation	Cottage and Small Scale	Large Scale
		3. Refractometers	3. Thermometers 4. Sensitive balance for pre-servatives 5. Refractometers 6. Pasteuriser for Brewed Vinegar
5.	Filling and sealing	1. Bottle filling machine 2. Bottle sealing machine 3. Crown corking machine 4. Weighing balance	1. Bottle filling machine 2. Bottle sealing machine 3. Heavy duty corking machine 4. Weighing machine
6.	Exhausting, sealing and processing for canning and bottling	1. Tanks with crates for exhausting 2. Semi-automatic double seamer 3. Cooling tanks 4. Minimum retorting capacity. 100 A2½ cans per charge 5. Pressure can tester	1. Exhaust box 2. Semi-automatic double seamer 3. Cooling tanks (adequate capacity) 4. Retorting capacity, 250 A2½ cans per charge 5. Pressure can tester

PART II

Specifications for Fruit Juice, Pulp Concentrate, Squashes, Cordials, Crush, Fruit syrups, Nectar, Aerated Water containing Fruit Juice or Pulp and ready-to-serve beverages

Products*	Variety	Special characteristics		General characteristics
		Minimum percentage of total soluble solids in the final product weight over weight	Minimum percentage of fruit juice in the final product	
Fruit Syrup	Any suitable kind and variety	65	25	Fruit juice shall be unconcentrated liquid product expressed from ripe fruit and may contain portions of the pulp and other cellular matter natural to the fruit. Concentrate, squash and crush shall contain fruit pulp. Cordials shall be the clear final product prepared by adding sugar to the clarified juice that is from which pulp and other cellular matter have been removed. The only substances that may be added to fruit juice or pulp are water, peel oil, fruit essences and flavours, common salt, sugar, invert sugar and/or liquid glucose, ascorbic acid, citric acid, permitted colours and preservatives. The acidity of the finished product shall not be less than 4 per cent in the case of pure lemon juice or pulp and not less than 5 per cent in the case of pure lime juice, but shall not exceed 3.5 per cent in the case of other juice, crush, squash, cordial, ready-to-serve beverage and syrup expressed as anhydrous citric acid. Canned pulp or juice shall not show any positive pressure at sea level. Canned or bottled pulp or juice shall show 'No' sign of bacterial growth when incubated at 37°C for one week. Canned pulp or juice will not contain any preservative. The finished product shall have a good flavour and be free from objectionable taints and flavours. It shall be of good keeping quality and should show no sign of fermentation. Ready-to-serve beverage may be carbonated. When frozen the product may be described as ice squash or ice cordial in conjunction with name of the fruit such as ice orange squash and the like. In case of mango juice 45 per cent water may be added if declared on the label. Concentrates shall be free from gelation or curdling and in case of orange concentrate, the pulp content shall not exceed 40% v/v.
Crush	"	55	25	
Squash	"	40	25	
Cordial	"	30	25	
Unsweetened juice	"	Natural	100	
Sweetened juice	"	10	85	
Ready-to-serve fruit beverages including aerated waters containing fruit juice or pulp	"	10	10	
Mango Nectar	"	15	20	
Fruit juice concentrate	"	32	100	

In the case of ready-to-serve beverages containing lime juice the minimum percentage of fruit juice shall remain as 5%.

PART II (A)

Specifications for Fruit Nectar

Product	Variety	Special characteristics		General characteristics
		Minimum percentage of total soluble solids in the product	Minimum percentage of fruit juice in final product	
Fruit Nectar (Excluding Orange and Pineapple nectars)	Any suitable kind and variety	15	20	Nectars shall be prepared from pulps extracted from fully ripe, sound fruits. Finished product shall contain good body, uniform colour and other portions of pulp or other cellular matter natural to the fruit. The only substances that may be added to the pulp or juice are water, sugar, invert sugar or liquid glucose, ascorbic acid and citric acid. The acidity as citric acid and alcohol content of the product should not exceed 1.5 and 0.1 per cent respectively. It should not contain any preservatives, artificial colours or sweetening matters. The finished products should possess characteristic flavour of the fruit and be free from burnt or objectionable taints and flavour. It should be free from larvae and other fruit insects. The product when canned shall not show any positive pressure at sea level and shall not show any sign of bacterial growth when incubated at 37°C for one week.*
Orange and Pineapple nectars	„	15	40	

PART II (B)

Specifications for canned mango pulp (natural)

Product	Variety	Total soluble solids	General characteristics
Mango pulp	Any suitable variety of mango	Not less than 12%	Mango pulp shall be extracted from sound ripe fruit. It shall possess the characteristic flavour of the variety of mango from which it is extracted. The material shall be passed through a minimum 1.5 mm. mesh sieve so as to have a homogenous product. It shall be free from any cooked flavour, black specks, extraneous matter namely portion of skin, fibrous matter, larvae and other insects or fragments thereof. The pulp shall not show any sign of bacterial growth when incubated at 37°C. The product shall not show any positive pressure at sea level.

The variety of the mango used in extraction of pulp shall be clearly and conspicuously marked on the container.

PART II (C)

Specifications for canned mango pulp (Sweetened)

Product	Variety	Total soluble solids	Minimum acidity	General characteristics
Canned Mango pulp (Sweetened)	Any suitable variety of mango	Not less than 15%	0.3% as Citric Acid	Mango pulp shall be extracted from sound ripe fruit. It shall possess the characteristic flavour of the variety of mango from which it is extracted. The material shall be passed through a minimum 1.5 mm. mesh sieve so as to have a homogenous product. It shall be free from any cooked flavour, black specks, extraneous matter namely portion of skin, fibrous matter, larvae and other insects or fragments thereof. The pulp shall not show any sign of bacterial growth when incubated at 37°C. The product shall not show any positive pressure at sea level.

The variety of the mango used in extraction of pulp shall be clearly and conspicuously marked on the container.

PART II (D)

Specifications for sweetened aerated waters with no fruit juice or fruit pulp or containing less than 10 per cent of fruit juice or pulp

Product	Variety	Total soluble solids	Definition and general characteristics
Flavoured Sweetened Aerated Waters	Sweetened aerated waters with single or composite flavours	Minimum 8%	Aerated water means potable water impregnated with carbon dioxide under pressure in properly sealed container and may contain any of the following singly or in combination: Sugar, liquid glucose, dextrose monohydrate, honey, invert sugar, fructose, saccharine not exceeding 100 parts per million, fruit and vegetable extractives (less than 10% on weight to weight basis), permitted flavouring and colouring matters, vitamins, preservatives, emulsifying and stabilising agents, citric acid, tartaric acid, phosphoric acid, malic acid, salts of sodium, calcium and magnesium, caffeine not exceeding 200 parts per million and edible gums and gelatin. The product shall not contain less than 5% total sugars of the net contents weight to weight.

Net weight of the contents may or may not be declared on the containers.

PART II (E)

Specifications for sweetened aerated waters with 10 per cent or more of fruit juice or fruit pulp

Product	Varieties	Total soluble solids	Minimum percentage of fruit and vegetable content	Definition and general characteristics
Sweetened aerated water containing fruit juice or pulp or bits	Sweetened aerated water with fruit, vegetable juice or pulp or bits	Minimum 10%	10 % in form of fruit juice or pulp or bits or other combinations of any fruit	Aerated water means potable water impregnated with carbon dioxide under pressure in properly sealed container and may contain any of the following singly or in combination. Sugar, liquid glucose, honey, dextrose monohydrate, invert sugar, fructose, fruit and vegetable extractives (more than 10% on weight to weight basis), permitted flavouring and colouring matters, vitamins, preservatives, emulsifying and stabilising agents, citric acid, tartaric acid, lactic acid, ascorbic acid, malic acid, salts of sodium, calcium and magnesium, and edible gums.

Net weight of the contents may or may not be declared on the containers

PART III

Specifications for barley waters (lemon, orange, grape fruit etc.)

Product	Variety	Minimum percentage of fruit juice in final product	Minimum percentage of total soluble solids in the final product weight over weight	Minimum percentage of barley starch in the final product	General characteristics
Barley waters	Any suitable variety	25	30	0.25	Barley of good quality free from insect attack or fungal diseases shall be used. Fruit juice shall be derived from sound fresh fruit free from insect or fungal attack or any other blemish affecting the quality of the fruit. It shall be free from the pieces of skin, bits of coarse tissue and any extraneous matter. The only substances that may be added are water, sugar, dextrose, invert sugar or liquid glucose, peel oil, flavouring matter, common salt, ascorbic acid, citric acid in sufficient quantity to bring the acidity of the finished product upto a maximum of 2.5 per cent as anhydrous citric acid, permitted colours and preservatives. The finished product shall have a good flavour characteristic of fruit used and be free from burnt or any other objectionable taints or flavours. It shall be of good keeping quality and shall show no sign of fermentation.

PART IV

Specifications for Synthetic Syrups, Ginger Cocktail, Ginger Beer, Ginger Ale and Sharbats

Product	Variety	Special characteristics Minimum percentage of total soluble solids in the final product weight over weight	General characteristics
Synthetic syrup and sharbats	Any kind prepared from harmless herbs, flowers or essences	65	The only substances that may be added are water, citric acid, harmless herbs, drugs, flowers, essence, juices (at least 10%), sugar, dextrose, invert sugar or liquid glucose, permitted colours and preservatives. The finished product shall have a good and pleasant taste and flavour, truly characteristic of the flavouring material used and be free from burnt or any other objectionable taints and flavour and crystallization of sugar. It shall be of good keeping quality and should show no sign of fermentation. No artificial sweetening agent shall be used.
Ginger cocktail, ginger beer, ginger ale	Any kind prepared from ginger or ginger essence	30	

The container of synthetic syrups will not bear any label which will lead the consumer into believing that it is genuine fruit product. In addition the label will have the word 'Synthetic' distinctly and clearly displayed on it. If the product declared as synthetic syrup does not contain fruit juice prescribed as specified above, the product will be clearly marked as 'contains no fruit juice'. Rose, khus, kewra, sandal and other such syrups may not be declared as synthetic but shall not bear pictures of fruits on the label.

PART V

Specifications for Bottled and Canned Fruits and Vegetables

Product	Variety	Special characteristics	General characteristics
Bottled or canned fruits	Any fruit of suitable variety	The head space in the can shall not be more than 1.6 cms. The drained weight of fruit shall not be less than 50 per cent of the net weight of the contents (except in the case of berry fruit where this limit will be 40 per cent). Drained weight shall be determined by draining the contents for two minutes on a sieve of dimensions 20.3 × 20.3 centimeters having 8 meshes per 2.5 centimeters.	The fresh fruit to be canned shall be approaching maturity and it shall be practically free from blemish and shall not have stalks, leaves and other extraneous matter. Where fruit is required to be cut it shall be cut in halves, quarters or cubes or pieces, reasonably uniform in size. The only substances that may be added are fruits, sugar, invert sugar, citric acid and water. After processing the fruit shall be firm and the covering liquid clear. The product shall not show any positive pressure at sea level and shall not show any sign of bacterial growth when incubated at 37°C for one week. No preservative shall be added. No artificial colouring matter shall be present, except in the case of cherries and strawberries where permitted colour may be added. The finished product shall have the characteristic taste of the original material and shall be reasonably free from disintegration, damage from bruises and shall be uniformly prepared.
Bottled or canned vegetables	Any vegetable of suitable variety	The head space in the can shall not be more than 1.6 cms. The drained weight of the vegetables shall not be less than 55 per cent of the net weight of the contents (except in the case of canned tomatoes where this limit will be 50 per cent). Drained weight shall be determined by draining the contents for two minutes on a sieve of dimensions 20.3 cms. × 20.3 cms. having 8 meshes per 2.5 cms.	The vegetables shall be reasonably fresh, tender, of good colour and flavour and shall be free from pods, stalks, detached skin, extraneous matter like woody fibre, roots etc., and shall be practically free from blemishes. The only substances that may be added are vegetables, sugar, salt, water, oil or fat, spices, sauce, citric acid and soluble calcium salt. The product shall not show any positive pressure at sea level and shall not show any sign of bacterial growth when incubated at 37°C and 55°C for one week. No preservative shall be used. No artificial colouring matter shall be present except in case of peas where permitted colour may be added. The finished product shall have the characteristic taste of the original material and shall be reasonably free from disintegration, damage from bruises and shall be uniformly prepared.

Peas or any other product which have been dried or otherwise processed before canning must be described as processed and may not be described as 'Green Fresh' or garden product. It shall be clearly marked as prepared from dried raw material. Dehydrated and dry fruits if canned shall be clearly marked as prepared from dried raw material.

PART VI
Specifications for Jams and Fruit Cheese

Product	Kind and variety of fruit	Minimum percentage of prepared fruit in the final product	Minimum percentage of soluble solids in the final product weight over weight	Special characteristics	General characteristics
Jam and fruit cheese	Any fruit any suitable variety	45 In case of raspberry and strawberry jams—25	68	The finished product shall have a heavy + consistency	It may be single or mixed fruit jam. The fruit used shall be mature, fresh, sound, clean and free from fermentation and mould. Dry or canned fruit, preserved pulp or juice may be used. Pectin derived from any fruit may be added when necessary. The only substances that may be added are sugar, dextrose, invert sugar or liquid glucose, flavouring matter, ascorbic acid, citric acid, permitted colours and preservatives. It shall have the flavour of the original fruit and shall be free from burnt or other objectionable flavours, crystallization and mould growth and shall show no sign of fermentation. If packed in cans, it shall not show any positive pressure at sea level. No artificial sweetening matter shall be added.

When dry fruit is used it shall be clearly declared on the label.

PART VII
Specifications for Fruit Jellies and Marmalades

Product	Kind and variety of fruit	Minimum percentage of prepared fruit in the final product	Minimum percentage of soluble solids in the final product weight over weight	Special characteristics	General characteristics
Fruit jelly and marmalade	Any fruit any suitable variety	45	65	Fruit jellies shall be made from clear strained fruit extract prepared by boiling the fruit with water. Marmalades shall be made either from citrus fruits prepared by boiling the fruit with water or shall be made from fruit juice or pulp. Marmalade shall have suspended slices of peel.	The fruit used shall be sound, clean and free from fermentation and mould. The finished product shall be reasonably uniform and shall be of good keeping quality and attractive colour. The only substances that may be added are sugar, dextrose, invert sugar or liquid glucose, ascorbic acid, citric acid, permitted colours and preservatives. Fruit jellies shall be a product of gelatinous consistency prepared by boiling strained fruit extract with sugar. It shall be clear, sparkling, transparent and of an attractive colour. It should not be syrupy, sticky or gummy and should retain the flavour and aroma of the original fruit. No artificial sweetening matter shall be added. It shall show no sign of fermentation.

The jelly made from sugar and chemical pectin shall be clearly declared as synthetic jelly.

"The label on the container of the synthetic jelly shall bear conspicuously the following, namely:

- (1) Synthetic Jelly . . . Flavoured (incorporating the name of the concerned flavour in the blank);
- (2) The product is not made out of any fruit".

PART VIII

Specifications for Candied and Crystallised or 'Glazed' Fruit and Peel

Product	Kind and variety	Special characteristics		General characteristics
		Percentage of total sugar weight over weight	Percentage of reducing sugar to total sugar	
Candied and crystallised or glazed fruit and peel	Any fruit of suitable variety	Not less than 70	Not less than 25	Candied fruit or peel shall be derived from firm, ripe or a slightly mature fruit practically free from insect or fungal attack or any other blemish affecting the quality of the fruit. The only substances that may be added are sugar, dextrose, invert sugar or liquid glucose, citric acid, soluble calcium salts, flavouring matter, citric acid, permitted colours and preservatives. 'Glazed' fruit or peel shall be derived from candied product coating with a thin transparent layer of heavy syrup with or without pectin which has dried to a more or less firm texture on the fruit. Crystallised fruit or peel shall be derived from candied product by coating with pure white crystallised sugar or by drying the syrup on wet candied fruit. The finished product shall be translucent and not hard or granular. It shall be free from burnt or any other objectionable flavour.

PART IX

Specifications for Preserves

Product	Kind and variety of fruit	Minimum percentage of fruit portion in fruit products	Minimum percentage of total soluble solids in the product weight over weight	General characteristics
Preserves	Any fruit of suitable variety	55	68	It may be a single or mixed preserve but fruit or vegetable used shall be mature, fresh, sound and clean. The only substances that may be added are sugar, dextrose, invert sugar or liquid glucose, flavouring matter, citric acid, ascorbic acid, permitted colour and preservatives. The fruit shall retain form and shall be permitted with the syrup without shrivelling of the individual pieces. It shall be of good keeping quality and attractive colour and it shall be free from burnt and other objectionable flavour, crystallization and mould growth. The product shall not show any fermentation when examined. When packed in cans, it shall show no positive pressure at sea level.

When packed in sanitary top cans, the content shall not be less than 85% of the total space of the can.

PART X
Specifications for Fruit Chutneys

Product	Variety	Special characteristics		Mould count	General characteristics
		Minimum percentage of fruit in the final product	Minimum percentage of total soluble solids in the product weight over weight		
Fruit Chutney	Any fruit of suitable variety	40	50	Not in excess of 40% of the field examined	The product shall be derived from fruit free from insect or fungal attack. All ingredients used in the preparation of chutney shall be thoroughly clean. The only substances that may be added are fruit, fruit pulp, raisins, dry fruit, spices, salt, sugar, onion, garlic, vinegar, acetic acid and permitted colours and preservatives. It shall be of good keeping quality and shall show no sign of fermentation when incubated at 28–30°C and 37°C. The acidity and ash content shall not exceed 2% and 5% respectively.

When it is declared as fruit chutneys, the name of fruits may not be declared on the label.
Any fruit when calculated in combination with raisins, and dry fruits if used in excess of 5% or 40% fruit content in mango chutney or other chutneys, shall be declared on the label.φ
The ash insoluble in hydrochloric acid shall not exceed 0.5% W/W.φ

PART XI
Specifications for Tomato Juice and Soups

Product	Variety	Special characteristics	Mould count	General characteristics
		Minimum percentage of total soluble solids weight over weight free of salt		
Tomato juice and soup	Any suitable variety of tomato	Tomato Juice—5; Tomato Soup—7	Not in excess of 30% of the field examined	Tomato juice shall be liquid product derived from sound, fresh and fully ripe tomatoes practically free from insect and fungal attack or any other blemish affecting the quality of the fruit and may contain finely divided insoluble solids from the flesh of tomatoes. It shall be free from pieces of skin, seeds, bits of coarse tissue and any extraneous matter. The only substances that may be added are salt, not in excess of 5% by weight, sugar, dextrose, malic acid, ascorbic acid, citric acid and permitted colours. In tomato soup the only substances that may be added are spices, sugar, salt, starch, butter and milk solids. The finished product shall have a good flavour characteristic of tomato and be free from burnt or any other objectionable flavour. It shall be of good keeping quality and shall show no sign of fermentation when incubated at 37°C for 7 days. When canned it shall not show any positive pressure at sea level.

PART XI (A)

Specifications for Vegetable Soups

Product	Variety	General characteristics
Vegetable soup	Any suitable variety of vegetable or combination of vegetables	The product shall be made from vegetable or vegetables free from insect or fungal attack. All the ingredients used in the preparation of the soup shall be thoroughly cleaned. The only substances that may be added are vegetable pulp, vegetables, milk solids, starch, rice, wheat, cereals and their extruded products, butter, onion, permitted colours, soup flavour and spices. It shall be of good keeping quality and shall show no sign of fermentation when incubated at 37°C and 55°C for one week. No preservative shall be used. The finished product shall have the flavour characteristic of the vegetable from which soup is made. The soup shall have uniform consistency.

PART XII

Specifications for Tomato Puree and Paste

Product	Variety	Special characteristics		General characteristics
		Mould count	Minimum percentage of total soluble solids weight over weight free of salt	
Tomato puree and paste	Any suitable variety of tomato	Not in excess of 60% of the field examined	Tomato puree—9% Tomato paste—25 %	The product shall be derived from sound, fresh and fully ripe tomatoes practically free from insect or fungal attack or any other blemish affecting the quality of the fruit. Properly prepared and strained tomatoes shall be free from skins and seeds. The only substances that may be added are common salt, citric acid, ascorbic acid, spices, permitted colours and preservatives. The finished product shall have a good flavour characteristic of the tomato and be free from burnt or any other objectionable flavour. It shall be of good keeping quality and shall show no sign of fermentation when incubated at 37°C for seven days. When canned it shall not show any positive pressure at sea level.

Percentage of total soluble solids shall be declared on the label.

PART XIII

Specifications for Tomato Ketchup and Sauce

Product	Variety	Minimum acidity as acetic acid	Minimum total soluble solids weight over weight	Special characteristics			General characteristics
				Mould count	Yeast and spores	Bacteria	
Tomato Ketchup	Any suitable variety of tomato	1.0%	25%	Not in excess of 40% of the field examined	Not in excess of 125 per 1/60 c.m.m.	Not in excess of 100 million per c.c.	The products shall be derived only from sound and wholesome tomatoes practically free from insect or fungal attack or any other blemish affecting the quality of the fruit; skins and seeds shall be excluded. The only substances that may be added are spices, salt, sugar, vinegar, acetic acid, onion, garlic, and preservatives. It shall not contain any other fruit or vegetable substances. The finished product shall have good flavour and shall be free from burnt or any other objectionable flavour. It shall be of good keeping quality and shall show no sign of fermentation, when incubated at 28-30°C and 37°C.

PART XIII (A)

Specifications for Sauces other than Soya Bean Sauce and Tomato Sauce

Product	Kind and variety	Special characteristics					General characteristics
		Mould count	Yeast and spores	Bacteria	Minimum percentage of acidity as acetic acid	Minimum total soluble solids weight over weight W/W	
Sauce	Any suitable kind and variety of fruit or vegetable	Not in excess of 40% of the field examined	Not in excess of 125 per 1/60 c.m.m.	Not in excess of 100 million per c.c.	1.2	15%	The product shall be derived from wholesome fruits and vegetables which shall be practically free from insect or fungal attack or blemishes affecting the quality of the fruit*. The only substances that may be added are fruit, vegetable pulp, juice, dried fruits, sugar, jaggery, spices, salt, vinegar, citric acid, acetic acid, malic acid, onion, garlic, flavouring materials, permitted colours, other than red or any shade of red colour and preservatives. The finished product shall have good flavour and shall be free from burnt or other objectionable flavour. It shall be of good keeping quality and shall show no sign of fermentation when incubated at 28-30°C and 37°C.

* The percentage of the various fruits and vegetables used in the sauce shall be declared on the label and the label shall not bear any picture of tomatoes.

@ PART XIII (B)

Specifications for Soya Bean Sauce

Product	Kind and variety	Minimum percentage of acidity as acetic acid weight over weight	Minimum total soluble solids weight over weight	Special characteristics			General characteristics
				Mould count	Yeast and spores	Bacteria	
Soya bean sauce	Any suitable variety of soya bean	0.6%	25%	Not in excess of 40% of the field examined	Not in excess of 125 per 1/60 c.m.m.	Not in excess of 100 million per c.c.	The product shall be derived only from sound and wholesome soya beans free from insect or fungal attack or any other blemish affecting the quality of soya bean. The only substances that may be added are spices, salt, sugar, vinegar, acetic acid, onion, garlic, permitted colours and preservatives. It shall not contain any other fruit or vegetable substances. The finished product shall have good flavour and shall be free from burnt or any other objectionable flavour. It shall be of good keeping quality and shall show no sign of fermentation* when incubated at 28-30 degree centigrade and 37 degree centigrade.

PART XIII (C)

Specification for Tamarind Concentrate

Product	Minimum percentage of acidity as tartaric acid	Ash soluble in acid	Total soluble solids	Freedom from moulds, insects etc.	General characteristics
Tamarind Concentrate	9%	Not exceeding 0.8%	Not less than 65%	Free from moulds living or dead insects fragments and rodent contamination	The product shall be derived from sound tamarind. The tamarind extract shall be properly strained and be free from pieces of stalk and fibrous matter. The concentrate shall have flavour characteristic of tamarind and be free from burnt and any other objectionable flavour and taste. It shall be of good keeping quality. Canned tamarind concentrate shall not show any positive pressure at sea level.

PART XIV

Specifications for Brewed and Synthetic Vinegar

Product	Variety	Special characteristics	General characteristics
		Minimum percentage of acidity in final product	
Brewed and synthetic vinegar	Any suitable medium such as fruits, malt, molasses, sugarcane juice etc.	Brewed vinegar-3.75 + gms of acetic acid per 100 ml Synthetic vinegar-3.75 gms of acetic acid per 100 ml	Brewed vinegar means a liquid derived from alcoholic and acetous fermentation of any suitable medium such as fruits, malt, molasses, sugarcane juice etc. Brewed vinegar shall conform to the following standards: 1. It shall contain at least 3.75 grams of acetic acid per 100 ml 2. It shall contain at least 1.5 per cent W/W of total solids and 0.18 per cent ash 3. It shall not contain (i) sulphuric acid or any other mineral acid, (ii) lead or copper, (iii) arsenic in amounts exceeding 1.5 parts per million, and (iv) any foreign substance or colouring matter except caramel 4. Malt vinegar, in addition, shall have at least 0.05 per cent of phosphorus pentoxide (P_2O_5) and 0.04 per cent of nitrogen. Brewed vinegar shall not be fortified with acetic acid. +

The kind of medium for preparing brewed vinegar shall be declared on the label. Synthetic vinegar shall be distinctly labelled as "Synthetic Vinegar" and shall state on labels "prepared from acetic acid".

PART XV

Specifications for Pickles in Vinegar

Product	Variety	Special characteristics	General characteristics
		Minimum percentage of acidity of fluid portion as acetic acid	
Pickles in vinegar	Any vegetable of suitable variety	Not less than 2 grams per 100c.c. as minimum percentage of acidity of fluid portion as acetic acid	The vegetable used in the preparation of pickles shall be wholesome. They shall be practically free from fungal or insect attack. All the ingredients used shall be thoroughly clean and free from extraneous matter. The fluid portion of the pickles, which shall be vinegar, shall constitute not more than $\frac{1}{3}$ of the total content and shall not contain any ingredient other than spices, salt and sugar. The pickles shall be free from added copper, mineral acids, alum or harmful colours and shall show no sign of fermentation. The product shall be reasonably free from sediment.

When more than one vegetable is used the product shall be labelled as "Mixed Pickles".

PART XVI

Specifications for Pickles in Citrus Juice or in Brine

Product	Variety	Minimum percentage of salt	Special characteristics	General characteristics
Pickles in citrus juice or brine*	Any fruit or vegetable of suitable variety	12%	In case of pickles in citrus juice citric acid shall not be less than 1.2%. Only citrus fruit juices shall be used	The vegetables and fruits used in the preparation of pickles shall be wholesome. They shall be free from fungal or insect attack or any type of rot. All the ingredients used shall be thoroughly clean and free from extraneous matter. Only substances that may be added are spices, salt, sugar, jaggery, onion, garlic, benzoic acid and soluble calcium salts. Pickles shall be free from added salts, copper, alum, mineral acids.

PART XVII

Specifications for Oil Pickles

Product	Variety	Oil	General characteristics
Oil Pickles	Any fruit or vegetable of suitable variety	Any edible vegetable oil like rapeseed, mustard, olive oil, etc.	The fruits and vegetables used in the preparation shall be wholesome and shall be free from fungal or insect attack. The only substances that may be added are spices, salt, oils, sugar, jaggery, onion, garlic, acetic acid, turmeric, condiments and permitted preservatives. All the ingredients used shall be thoroughly clean and free from extraneous matter. The pickle shall be of pleasant taste and flavour, and be free from added copper, alum, mineral acids.

Kind of fruit or vegetable used shall be declared on the label.

PART XVIII

Specifications for Sun-dried and Dehydrated Fruits

Product	Variety	General characteristics
Sun-dried and dehydrated fruits	Any fruit of suitable variety	The fruit used for drying shall be clean, wholesome and shall be practically free from insect or fungal attack. The dried or dehydrated fruits may contain permitted preservatives. The product shall be free from visible mould, insect or larva. In dehydrated and sun-dried fruits, the moisture content shall not exceed 20% and 24% W/W respectively.

The kind of dried fruit packed in the container shall be declared on the label.

PART XVIII (A)

Specifications for Mango Cereal Flakes

Product	Variety	Characteristics	General characteristics
Mango Cereal Flakes	Fruit of suitable variety	Moisture not more than 2.5 per cent. Acid insoluble ash not exceeding 0.5 per cent. Protein not less than 3.0 per cent. Starch not exceeding 25.0 per cent	The product shall be prepared from clean wholesome mangoes free from insect or fungal attack. The only substances that may be added are fruit pulp, wheat starch, sucrose, glucose, sodium bicarbonate and pectin. The product shall have taste and flavour characteristic of the fruit. The product shall be crisp but not tough or leathery. No synthetic flavouring agents shall be added.

Variety of fruit used and the composition shall be declared on the label.

PART XIX

Specifications for Sun-dried and Dehydrated Vegetables

Product	Variety	Special characteristics	General characteristics
Sun-dried and dehydrated vegetables	Any vegetable of suitable variety	Ash insoluble in hydrochloric acid shall be not more than 0.5%.	The product shall be prepared from wholesome vegetables free from blight, discolouration or fungi. Only the edible portion of the vegetable shall be used and it shall be free from stalks, peels, stems and extraneous leaves. The dried or dehydrated vegetable may contain permitted preservatives. The finished product shall be of good edible quality and shall reasonably reconstitute to its original shape and quality on boiling from fifteen minutes to an hour. The finished product shall be free from visible mould, insect or larvae.

Kind of dry vegetable shall be declared on the label.

PART XIX (A)

Specifications for Dehydrated Onions

Product	Variety	Special characteristics			General characteristics
		Moisture % W/W	Total Ash% W/W	Acid in- soluble Ash% W/W	
Dehydrated Onions except onion powder	Any suitable variety	8	5	0.5	The dehydrated onions shall be the product prepared from clean, sound bulbs and suitable varieties of onion, free from blemish and disease, after proper washing, peeling, trimming and slicing and dehydrating in a manner which ensured effective preservation of colour, flavour, texture and food value. The dehydrated onions shall have the characteristic colour and marked pungent flavour of the variety used. It shall be free from discolouration and musty, rancid, scorched or other objectionable flavour or odour. When in the form of powder, it shall be free flowing and free from agglomerates. The product shall be free from moulds living or dead, insects and insect fragments and rodent contamination. The total extraneous matter including black, brown or dark brown pieces, outer skin, outer root-base, rudiment or sediment attached to onion seed, stems and foreign matter, such as other vegetables shall not exceed 3% by weight. It shall be free from any preservatives, bleaching substances, artificial colouring matter or flavouring agents. The dehydrated onion flakes, after steeping in water for four hours, shall reconstitute to form a product approximately to raw freshly peeled and cut onion of good quality. When 30 gms. of dehydrated onions are cooked with 250 ml of boiling 1% sodium chloride solution for fifteen minutes, the dehydrated onion shall reconstitute to crisp product free from toughness or mustiness and having the typical flavour, colour and odour of cooked onions. The rehydration ratio i.e. ratio of increase in weight after cooking and draining off excess liquid to its weight before cooking shall not be less than 1 : 5.

PART XX

1. Fruit and vegetable products shall be packed in such suitable containers described below and all containers shall be securely packed and sealed.

- (a) Canned fruits, juices and vegetables: Sanitary top cans made from steel kind of diaphane shall be used for canning fruits, juices and vegetables.
- (b) Bottled fruits, juices and vegetables: Bottles and jars capable of hermetic seal shall be used.
- (c) Juices, squashes, crush, cordials, syrups, barley waters and other beverages shall be packed in clean bottles and securely sealed. These products frozen and sold in the form of ice shall be packed in suitable cartons or pulp may be packed in wooden barrels when sulphured.
- (d) Preserves, jams, jellies and marmalades: New cans, new containers, clean bottles, chinaware jars or aluminium containers may be used for these products and it shall be securely sealed.
- (e) (i) *Pickles: Clean bottles, jars, wooden casks, tin containers covered inside with polythene lining of minimum 250 gauge or suitably lac cans shall be used.
- (ii) Tomato ketchup and sauces: Clean bottles shall be used. If acidity not exceed 0.5% as acetic acid, open top sanitary cans may also be used.
- (iii) Vinegar and Chutney: Clean bottles or wooden casks may be used*.
- (f) Canned fruits and peels and dried fruits and vegetables: Paper canthared or wooden boxes, new tins, bottles, jars, aluminium or suitable approved containers shall be used.

2. Following particulars shall be clearly marked on the containers:

- (a) Kind and variety of fruit.
- (b) Nature of the Product, viz., juice, squash, marmalade etc.
- (c) Net weight or volume of the contents (variation in net content may be made in case of bottled fruit products).
- (d) Name and address of the manufacturer or the brand owner.
- (e) Where any permitted preservative and/or colouring agent other than natural colour is added, a statement to the effect that it contains permitted preservatives and/or colouring agent, other than natural colour.

3. The manufacturers of fruit products licensed under this Order shall, be allowed to export the products, if necessary, without indicating the name of the manufacturer provided that the declaration 'Made in India' or 'Product of India' along with the license number issued to them under this Order is indicated on the labels affixed to the container of such fruit product or vegetable product.

PART XXI

Limits of Poisonous Metals in Fruit Products

No fruit products specified in column 2 of the table below shall contain any poisonous metal specified in column 3 of the quantity given in column 3 of the said table.

Name of the product	Parts per million by weight
(i) Concentrated soft drinks (but not including concentrates used in the manufacture of soft drinks) (ii) Fruit and vegetable juice (including tomato juice, but not including lime juice and lemon juice) (iii) Concentrates used in the manufacture of soft drinks, lime juice and lemon juice (iii) (a) Soft drinks excluding concentrates (iv) Dried or dehydrated vegetables (other than onions) (v) Dehydrated onions (vi) Fruit products not specified	0.5 1.0 2.0 Nil 5.0 on the dry matter 10.0 2.5
(i) Soft drinks excluding concentrates (ii) Concentrates for soft drinks (iii) Tomato ketchup on the dried total solids (iv) Tomato puree, paste, powder, juice and cocktails (v) Fruit Products not specified	5.0 20.0 50.0 on the dried tomato solids 100.0 30.0
(i) Soft drinks intended for consumption after dilution (ii) Dehydrated onions (iii) Fruit products not specified	Arsenic 0.50 Arsenic 2.0 Arsenious Oxide 2.6 Arsenious Oxide 1.0
(i) Processed and canned products (i) (a) Soft drinks excluding concentrates (ii) Fruit Products not specified	250.0 100.0 250.0
(i) Ready-to-drink beverages (ii) Fruit products covered under this Order	5.0 19

PART XXII

List of Permissible Harmless Food Colours

(1) Natural colouring matter which may be used. The following natural colouring principles whether isolated from natural colours or produced synthetically may be used in or upon any fruit product:

- (a) Cochineal or Carmine.
- (b) Carotene and Carotenoids.
- (c) Chlorophyll.
- (d) Lactoflavin.
- (e) Caramel.
- (f) Annatto.
- (g) Ratanjot.
- (h) Saffron.
- (i) Curcumin.

(2) Coal tar dyes which may be used — No coal tar dyes or a mixture thereof except the following shall be used in fruit products:—

Colour	Common name	Colour index	Chemical class
1. Red	Ponceau 4R	(1580) 16255	azo
	Carmosine	14720	azo
	Fast Red E	16045	azo
	Amaranth	16135	azo
	Erythrosine	45430	Xanthene
2. Yellow	Tartrazine	19140	Pyrazolone
	Sunset Yellow FCF	15985	azo
3. Blue	Indigo Carmine	73015	Indigoid
	Brilliant Blue FCF	42090	Triary imine
4. Green	Green S	44090	do
	Fast Green FCF	42035	do

(3) Dyes when used in fruit products shall be pure and free from all harmful impurities.

The maximum limit of any permitted coal tar colours or mixture of permitted coal tar colours which may be added to any fruit products shall not exceed 0.20 gram. per kilogram (g) of the final fruit product for consumption only those permitted coal tar colours which are sold under the Indian Standard Institution Certification Mark shall be used in the manufacture of fruit products.

PART XXIII

Limits for permitted Preservatives in Fruit Products

Permitted preservatives are :

- (a) Benzoic acid including salts thereof ; and
- (b) Sulphurous acid including salts thereof.

The quantities of individual preservatives permitted to be used in various fruit products shall be as mentioned in the Table below :

Fruit Products	Preservative : Parts per million
1. Fruit and fruit pulp or juice (not dried) for conversion into jam or crystallized, glazed or cured fruit or other products.	
(a) Cherries	Sulphur dioxide 5,000
(b) Strawberries and raspberries.....	do 2,000
(c) Other fruits.....	do 1,000
2. Fruit juice concentrate.....	do 1,500
3. Dried fruits :	
(a) Apricots, peaches, apples, pears and others	do 2,000
(b) Raisins or sultanas.....	do 750
4. Squashes, crushes, fruit syrups, cordials, fruit juices and barley waters.....	Sulphur dioxide 350 or Benzoic acid 600
5. Jam, marmalade, preserve and fruit jelly	Sulphur dioxide 40 or Benzoic acid 200
6. Crystallized, glazed or cured fruit (including candied peel).....	Sulphur dioxide 150
7. Fruit and fruit pulp not otherwise specified in this schedule.....	do 350
8. Sweetened ready-to-serve beverages.....	Sulphur dioxide 70 or Benzoic acid 120
9. Pickles and chutney made from fruits and vegetables.....	Sulphur dioxide 100 or Benzoic acid 250
10. Tomato and other sauces.....	Benzoic acid 750
11. Dehydrated vegetables.....	Sulphur dioxide 2,000
12. Tomato puree and paste.....	Benzoic acid 250
13. Syrups and sharbats.....	Sulphur dioxide 350 or Benzoic acid 600

In case sulphur dioxide is used as preservative in pickles and chutneys the product should be packed in containers other than tin containers.

Explanation. In case of the fruit products wherein use of two different preservatives has been permitted, a combination of the two preservatives can also be used subject to the condition that the quantity of each preservative used does not exceed such number of parts out of those prescribed for that preservative in the third column of the aforesaid Table as may be worked out on the basis of the proportion in which such preservatives are combined.

PART XXIV

(a) * In fruit products, pectin, sodium alginate, calcium alginate, alginic acid, propylene glycol alginate, mono-sodium glutamate, calcium chloride, calcium lactate and other soluble calcium salts may be added.

(b) Lecithin and tocopherol may be added in fruit products as antioxidants.*

* Amendment as per S.O. 2942.

- Amendments as per S.O. 2662.

⊙ Amendments as per S.O. 1011.

% Amendments as per S.O. 166.

° Amendments as per S.O. 582.

+ Amendments as per S.O. 1890.

O Amendments as per S.O. 3427.

⊕ Amendments as per S.O. 5593.

⊖ Amendments as per S.O. 621. &

Amendments as per S.O. 3044.

£ (Amended up to 31st December 1974)

QUALITY CONTROL IN FRUIT AND VEGETABLE PROCESSING

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Quality of foods refers to the composite characteristics which differentiate individual units and enable determination of the degree of acceptability by the consumer. The overall quality of a food product may be broken down into component characteristics such as: colour, texture, flavour, nutritional value, freedom from harmful microorganisms and undesirable substances, etc. Each of these may be measured and therefore controlled independently. Quality is a measure of the degree of excellence. For purposes of control, it may be considered as specifications. The precision and the accuracy of the specifications are the two important requirements of quality control.

The purpose of quality control is to ensure production of products which meets the defined standards within the accepted tolerances, at a cost which is compatible with the market for which it is designed, and the price at which it will sell. Hence, quality control involves control of (i) raw material, (ii) process, and (iii) examination of the finished product. Once a product has gone through the manufacturing process, little can be done to alter its quality or to overcome the faults. Examination of the finished product, at the most, represents analysis with respect to standards—to accept or reject. Hence, quality control is more concerned with the control of raw material and control of processes used. Invariably, it is not possible to ensure absolute control over the quality

of raw material and of the processes and hence, examination of the finished product becomes necessary. Effective control over raw materials and processes minimizes the efforts needed in the examination of the finished product and consequent rejection if the product is not up to the desired standard.

Quality of Vegetables and Fruits

In the preparation of fruit and vegetable products, the edible raw materials consist of fruits, vegetables, sugar, salt, spices, colours, preservatives, flavouring materials, etc.

Vegetables

Different varieties of a given vegetable substantially differ in size, shape, time of maturity and resistance to physical damage. Varietal differences may further extend to storage stability and suitability for various types of processing—canning, freezing, pickling, drying etc.

When vegetables are maturing, the quality changes from day to day, and at a certain time, attain the peak quality from the standpoint of colour, texture and flavour. The peak quality is transient and may last for a day or two. Harvesting and processing must be so scheduled as to capture this peak quality. Thereafter, sensory quality condition which is independent of microbial spoilage may quickly pass. For example, sweet corn, in just 24 hr at 20°C

(68°F), lost 26 per cent of sugar with comparable loss of sweetness. Even at 0°C (32°F), 8 per cent of sugar was lost in 1 day and 22 per cent in 4 days (Table 1). Similar losses may occur in other vegetables. Though the losses may be less when stored at low temperature, still vegetables may lose their sweetness and freshness within 2 or 3 days of storage.

TABLE 1
Loss of sweetness in sweet corn during storage¹

Storage period hr.	Storage temperature °C loss in total sugars	
	32°F	68°F
24	8.1	25.6
48	14.5	45.7
72	18.0	55.5
96	22.0	62.1

Along with the loss of sugar, the evolution of heat is a serious problem where large quantities of vegetables are transported or held prior to processing. Potter² states that vegetables will liberate heat at a rate of 1,20,000 BTU/ton/day which is sufficient enough to melt 800 lb. of ice per day. Since the heat deteriorates the quality of the vegetables and speeds up the growth of the microorganism, the harvested vegetables must be cooled down immediately if not processed. Each vegetable has its own optimum temperature of cold storage. Temperature lower than the optimum may cause a low temperature injury.

In addition to loss of sweetness, vegetables lose plumpness and shrivel while leafy vegetables wilt, and all lose weight due to continuous loss of moisture after harvest. Hence, vegetables should be processed as quickly as possible after harvest.

Fruits

Fruit quality goes back to tree stock, growing practices and weather conditions.

The degree of maturity and ripeness when picked, and the method of picking and harvesting are important from the point of view of processing. There is some distinction between maturity and ripeness of a fruit. Maturity denotes the condition when the fruit is ready to eat or if picked will become ready to eat on further ripening. Ripeness is that optimum condition when colour, flavour, and texture have developed to their peak. Soft fruits like banana, mango, peach and cherry are picked when they are mature but not yet ripe as the fully ripe fruits are soft and may get damaged even during picking. Furthermore, many fruits continue to ripen even after harvesting.

Appropriate time to pick the fruit depends on variety, location, weather and ease of removal from the tree. Orange, for example, change with respect to sugar and acid as they ripen on the tree. Sugar increases and acid decreases. The sugar/acid ratio determines the acceptability. Pineapples do not ripen if picked raw while the entire fruit still looks green. In general, fruits for canning should be slightly less ripe than for table use as processing causes further softening.

Fruits and vegetables for processing are selected on the basis of maturity and ripeness. In general, vegetables (with exception of root crops like potato, beet root, onions etc.) are of higher quality when less mature on account of their being more tender, succulent, less fibrous, less starchy. Fruits, when ripe, are of higher quality as they would be larger, sweeter, less sour and/or succulent. Beans and peas are more tender and more flavourful when less mature, while a ripe mango is larger, more sweet, succulent. However, too immature vegetables may considerably reduce the yield while over ripe fruits become soft and mushy on processing.

Effect of Cultural Practices on Quality

Quality control should be exercised during the production of the crop. Irrigation, application of chemicals to growing crops, pesticides, etc. have significant effect on the quality and yield of the product. Fruits and vegetables intended for fresh market when irrigated towards the end of the growing season helps in maximising the yield. On the contrary, if the crop is intended for use in preparing a concentrated or dehydrated product, irrigation towards the end should be reduced or entirely suspended to increase the weight of the solids and reduce the cost of concentration or dehydration.³ Similarly, organic nitrogen increases the protein content by as much as 50 per cent⁴. Spraying of oranges with lead arsenate, and potatoes and cherries with copper sulphate result in increased sugar content⁵. Pesticides may exert profound effects on external appearance. Cherries sprayed with copper salt result in considerable increase in defects⁶. Application of 2,4-D causes reduction in tomato size. Certain herbicides cause citrus fruits to turn yellow and even to brown⁷. Mahoney⁸ has written a comprehensive review on the effects of pesticides on flavour. BHC has been reported to cause off-flavours which is more perceptible after processing.

Staggered Harvesting

Fruits and vegetables do not ripen uniformly and have only a short period of optimum maturity. Hence, it is essential to time the harvest so that the grower and the processor can benefit. Methods by which the harvesting season can be extended are (i) to stagger the date of planting, (ii) to use several varieties some of which mature early and others late, and (iii) to get raw materials from different growing areas.

Generally, information for optimum maturity is calculated depending on the number of days from sowing the seeds, planting or flowering. Such information is useful provided no serious fluctuations occur in edaphic and climatic conditions during the growing season. The variations are the rule rather than the exception. A more precise concept of temperature summation in terms of degree-hours or degree-days was conceived several decades ago⁹. This concept has been successfully applied in the case of peas and is based on the fact that each crop and in some cases each variety has a base-line temperature below which there is no measurable maturation. For sweet corn, this base-line temperature is 50°F. A heat unit consists of one degree above this temperature for each hour following the sowing of seeds. Thus 1 hour at 60°F is counted as 5 heat units while 1 hour at 75°F is counted as 20 heat units. Golden Cross Bantam variety of sweet corn is considered ready for harvest when the heat units summation reaches 47,000. The figures for Victoria Golden, Illinois 8×6, and Illinois 13 varieties are 48500, 50000 and 51500 respectively². Alaska peas are considered ready for harvest when the accumulated heat units of temperature summation reaches 2900 hour-heat units or 1200 day-heat units.³ In addition to temperature summation, rainfall and hours of sunlight are also included and a multiple regression equation applied to predict the time of harvest.³ Kramer³ states that in practice major use of this procedure is made to determine the dates of planting rather than dates of harvest.

Quality Factors and their Measurement¹⁰

Food quality which is detectable by our senses can be broken down into three main categories viz., (i) appearance factors, (ii) textural factors, and (iii) flavour factors—the properties generally experienced by all

and referred to as organoleptic or sensory properties since they are perceived by the senses (Table 2). Appearance includes size, shape, wholeness, different forms of damage, gloss etc. Texture includes hand feel and mouth feel (of firmness, softness, juiciness, chewiness etc.). Flavour includes both taste and odour (sweet, salty, sour, bitter, fragrant, acid, burnt and so on). Flavour and aroma are largely subjective and hard to measure accurately. Measurement of these quality factors are discussed below.

Size and Shape

Size and shape are easily measured with simple devices such as scales, screens, micrometers, planimeters etc. Size, shape, and wholeness, make important contributions to the appearance of the fresh material as well as processed product. In the packaged product, container, label and the pattern of arrangement (as e.g., the way in which chilli is placed in a bottle of chutney or pickle) contribute to the appearance of the product. Wholeness refers to degree of whole and broken or mushy pieces (canned mango slices may

have a few soft and mushy pieces). Appearance also includes the positive and negative aspects.

Defects are imperfections due to the presence of something that detracts from perfection. Defects in processed fruit and vegetable products include (i) deformation due to hereditary abnormality or unfavourable environment, (ii) insect or disease injury, (iii) mechanical injury caused during handling, transportation or manufacture such as bruising, crushing etc., and (iv) extraneous foreign matter which might be harmless but not a part of the edible portion such as presence of eyes in pineapple slice, peel in mango slice etc.

Colour

Surface colour is of importance for the fresh produce market and internal colour for the processed products. While the green colour is a desirable attribute in vegetables, it is indicative of insufficient ripeness in fruits.

Colour is caused by the spectral distribution of light. Glossiness (finish in apples, mangoes, peaches etc.), transparency, haze and turbidity are properties of material

TABLE 2. *Some quality characteristics*

I. Appearance Factors (eye appeal judged by sense of sight)	
A.	Size, shape, wholeness, pattern
B.	Defects: damage, bruising, extraneous matter, specks, sediment
C.	Spectral: gloss, transparency, turbidity, colour (lightness, chroma, hue)
D.	Consistency: viscosity, gel, flow, spread (These characteristics may also be apparent to the sense of touch)
II. Kinesthetic Factors (hand and mouth feel, judged by sense of touch)	
A.	Hand feel: firmness, softness, juiciness
B.	Mouth feel: chewiness, fibrousness, graininess, meakness, stickiness
III. Flavour Factors (judged by sense of taste and smell)	
A.	Odour: fragrant, acid, burnt, gritty etc.
B.	Taste: sweet, sour, salty, bitter etc.
C.	Off-flavour: enzymatic, physiological, chemical, contaminated, mouldy etc.

Source: Kramer, A., in *Food Processing Operations*, Ed. Joseph, M.A. and Held, J. Inc. Vol. 1, p. 93 (1968).
The Avi Publishing Co. Inc., West Port, Conn., U.S.A.

tributable to the geometric manner in which light is reflected or transmitted.

Colour of clear beverages like grape juice, orange juice cordial, syrups etc., or if a coloured extract can be obtained from the food, then a colorimeter or a spectrophotometer can be used for colour measurement. These instruments can also measure the clarity or cloudiness of a liquid depending upon the amount of light transmitted.

To denote colour, reference is frequently made to colour dictionaries.¹¹ These are not entirely satisfactory because of the difficulty of matching colour. The colour of the food can also be measured by comparing it to defined colour disks or tiles. These are available in hundreds of colour shades and are defined by number. In the Macbeth-Munsell disk colorimeter, the food is placed under controlled lighting between two coloured disks which closely match the colour of the sample. The disks are changed until the closest match is made. The colour of the food can then be defined as being identical to the matching disk or falling between the two nearest disks.

The visual colour depends on the spectral distribution of the light reflected from it. Light reflected from a coloured object can be divided into three components which have been termed hue, value and chroma. Hue is the predominant wavelength which determines whether the colour is red, green or yellow; value (Y per cent) refers to the lightness or the darkness of the colour and chroma refers to the intensity of the colour. When it is combined with the spectral data for a light source plus the spectral response of a standard observer, a measurement of colour is obtained. The values X, Y, Z (tristimulus values) plus the trichromatic coefficients x and y are easily calculated from the readings taken using the reflectance colorimeters. Since it is not easy to visualize the colour or a colour

difference from the above values, the general practice is to plot y vs x on a diagram known as the Maxwell Colour Mixture diagram. It is then possible to find the dominant wavelength of the colour (hue), and the purity of the colour which is a measure of its saturation. Hue and purity together with brightness (Y per cent) give a better concept of colour or colour difference. For example, two colours having the same x and y values but with a different Y would only differ in brightness. This is known as tristimulus colorimetry and is the basis of several reflectance colour measuring instruments and systems of colour notation.

Since results with tristimulus colourimeters are obtained as three distinct values, they are frequently difficult to explain unless they are converted into single colour values. For practical purposes, charts or nomographs may be employed, where the discreet tristimulus values may be located and the colour value read directly without calculation.^{10,13,15}

The measurement of surface colour presents several problems. When the unit size is small (peas, corn, berry fruits etc.) a representative sample can be measured. When the unit size is large (mangoes, peaches, tomato etc.) individual units have to be measured. Furthermore, the colour within the same fruit in all the parts may not be the same. Spinning of the sample has been suggested¹² but it is of questionable value.

A number of instruments are commercially produced for the purpose. The most basic of these instruments, and by far the most expensive, is the Hardy spectrophotometer equipped with a tristimulus integrator. A less expensive, precise and practical instrument is the Hunter colour-difference meter. Photovolt reflectometer is less automatic and less precise.¹²

Anthocyanins, chlorophylls and carotenoids are generally responsible for colour of fruits and vegetables. Pigment determination, though used as a measure of colour quality of processed products, is rarely used for measuring the colour of fresh produce even when intended for processing.

The U.S. Department of Agriculture has evolved a series of colour reference tiles, or plastic-models for acceptance inspection of the raw produce.¹⁴ Although they lack precision, they are useful in the field work as practical aids for colour grading.

The colour of fruits and vegetables can be measured by reflectance measurements. Fruits and most of the vegetables undergo changes during ripening and processing. For example, mangoes change their colour from green to yellowish-red during ripening. Chlorophyll in vegetables undergoes changes during processing. Kramer³ suggests that colour measurement limited to lightness only is a good indicator of end product colour quality in those instances where lightness is the dominant colour quality of the processed product as well. This applies even to green vegetables which may not remain green after heat-processing.

Viscosity and Consistency

Viscosity may be explained as the flow of liquids divided in layers. The friction resulting from the resistance to flow between the liquid layers or the resistance offered by a substance to deformation when subjected to a shearing force is called consistency or apparent viscosity. Fluids which are chemically pure and physically homogeneous (Newtonian fluids) have a constant consistency value if the static pressure and temperature are fixed; for such substances, the consistency is usually called the viscosity (equal to absolute viscosity).¹⁶

Viscosity or consistency can be measured in several ways:^{16,17} (i) time taken to flow

through a capillary tube (Ostwald viscometer, Jelmeter etc.), (ii) time required for efflux through an orifice (Saybolt viscometer, Zahn viscometer and the Gardner 'one-shot' viscometer), (iii) time required for a weight to fall through a tube containing the material being tested (Gardner Mobilometer), (iv) resistance to rotation of a spindle or cylinder immersed in the test material (torsion viscometers which measure the torque on the rotary part of the instrument, e.g., Brookfield Syncolectric viscometer, Stormer viscometer, F.M.C. consistometer etc.) and (v) measurement of spread or flow of material in a given period of time (Bostwick consistometer, Adams consistometer and the Plastometer). The Ostwald viscometer is used for measuring the viscosity of pectin solutions, syrups and other clear liquids. Brookfield synco-lectric viscometer, Stormer viscometer, Bostwick consistometer and Adams consistometer are used for measuring the consistency of custards, cream-style corn, juices, pulps, tomato puree, ketchup etc.

Texture

Textural (also called kinesthetics) qualities of foods are those which we can feel with the fingers, the tongue, the palate, or the teeth. The range of texture is considerable, and the departure from an expected texture is a quality defect. Apples are expected to be firm; mango, peach or plum to be soft; sweet corn to be juicy and potato chips to be crisp. Physical instruments are intended to simulate and measure the sensations which the consumer experiences through the sense of feel with the fingers and more particularly in the mouth.

Kramer and Twigg¹⁰ classify the sensory characteristics into finger feel (firmness, softness or yielding quality and juiciness) and mouth feel (chewiness, fibrousness, grittiness, mealiness, stickiness and oiliness).

Śzczesniak¹⁸ has related textural parameters to popular nomenclature (Table 3). Instruments developed for measuring the texture are tenderometer, texturometer, puncturometer, succulometer, pressure tester etc. In spite of a large array of these instruments, the basic principles involved are only a few and mainly consist of measurement of resistance to force. If the food is squeezed so that it still remains as one single piece, it is compression as with squeezing of bread. If a force is applied so that the food separates into two and one part slides off the other, it is shearing—

as in the chewing of gum. If the force is applied in such a way as to divide the test unit so that the two portions remain in their original position in relation to each other, it represents cutting—as in the cutting of an apple. If the force is applied away from the material to pull the test material apart, it is a measure of tensile strength—as in the pulling of a muffin. The combined application of shear-pressure force simulates the action of the teeth which first compress and then shear the food. Instruments such as the tenderometer, texturometer and the shear-press act essentially in this

TABLE 3. Relationship between textural parameters and popular nomenclature¹⁸

<i>Mechanical Characteristics</i>		
Primary Parameters	Secondary Parameters	Popular Terms
Hardness		Soft→Firm→Hard
Cohesiveness	Brittleness	Crumbly→Crunchy→Brittle
	Chewiness	Tender→Chewy→Tough
	Gumminess	Short→Mealy→Pasty→Gummy
Viscosity		Thin→Viscous
Elasticity		Plastic→Elastic
Adhesiveness		Sticky→Tacky→Goey
<i>Geometrical Characteristics</i>		
Class		Examples
Particle size and shape		Gritty, Grainy, Coarse etc.
Particle shape and orientation		Fibrous, Cellular, Crystalline etc.
<i>Other Characteristics</i>		
Primary Parameters	Secondary Parameters	Popular Terms
Moisture content		Dry→Moist→Wet→Watery
Fat content	Oiliness	Oily
	Greasiness	Greasy

manner. Methods developed for measuring the textural qualities of fruits and vegetables are discussed below.

A. Instrumental methods

Succulence or the juiciness is associated with the moisture content and could provide the information regarding the stage of maturity. Kramer and Smith^{18a} developed succulometer to replace the subjective 'thumbnail' method of measuring the maturity of sweet corn. A cylindrical cell is filled with 100 g of kernel. A plunger which is 0.127 mm smaller than the inside diameter of the cylinder is then placed in the sample and the pressure is applied gradually in a hydraulic press until the pressure applied reaches 35155 g/cm² (500 lb./in²), and is held at that pressure for 3 min. The expressed juice is collected in a measuring cylinder and the volume is noted which gives an indication of the succulence or maturity of the sweet corn.

The succulometer is also made use of to determine the residual storage life of apples, and the water holding capacity of the reconstituted dehydrated products. Apple is peeled, cored and shredded, and 50 g of the material is used for noting the yield of the juice using the instrument as in the case of corn. Freshly harvested apple yields 15-20 ml juice which gradually drops to 10 ml during storage and then rather abruptly to 5 ml. At the time when this abrupt drop in juice yield is observed during storage, apples show first signs of surface wrinkling.⁸ The dehydrated fruits and vegetables do not usually reconstitute to the original fresh weight. Furthermore, the absorbed water may not be held firmly so that the reconstituted product has more of a watery appearance rather than the juicy appearance. If the water expressed using succulometer is more, the reconstituted product is less likely to be juicy.

Tenderometer developed by Martin¹⁹ in 1937 applies compression and shear to

measure the tenderness of peas. It is widely used for determining the tenderness of raw peas for canning. A value of 90-95 indicates fancy quality peas while the values over 100 indicates a lower grade standard, and peas testing 100-180 may be expected to yield a substandard end product.

In 1951, Kramer *et al.*^{19a} devised the shear press which could be used with a variety of fruits and vegetables. It consists of a basic unit which is capable of applying force under controlled rates of time with the amount and rate of force exerted being easily calibratable. The range of force applied could be varied from a few grams to tonnes. The error of the basic unit is stated to be less than 0.5 per cent which is quite adequate for all control purposes. Kramer³ has given method of testing some fruits and vegetables. The force range varied from 20-100 lb. with asparagus or canned tomato to 3000 lb. with sweet corn.

Instron Universal Testing Machine which applies force under controlled conditions like the tenderometer is more precise and versatile but expensive. Bourne *et al.*²⁰ have discussed the measurement of food texture using this machine.

The instrumental methods of measuring described above and others are based on applying force under controlled conditions. The success of the procedure in predicting the quality is, however, dependent on the design of the test cell employed for the purpose.^{3,21}

Shear press and similar instruments frequently are connected to a moving recording chart. The time force curve traced on the chart gives a graphic representation of the rheological properties of the food item. Where an apple or a pear half is tested, the tracing would show an initial high degree of force required to break the skin, and then a change in force as the compressing-shearing element enters and passes through the pulp.

Magnus-Taylor Pressure Tester is generally used for measuring the maturity of fruits.^{22,23} It consists of a spring scale to which is attached a carefully machined rod. The free end of the rod is round at the bottom. As the rod is pressed into the fruit or vegetable, the spring is compressed until the yield point is reached when the rod penetrates into the material. The force required to achieve this penetration is read in terms of pounds. The instrument is light, portable and can be used while the fruit is still attached to the plant but has the disadvantage that the results may vary with the operators, and the results represent that of a particular fruit or vegetable examined and not of the entire lot. To overcome the variations in the result obtained by different operators using Magnus-Taylor Pressure Tester, Schomer *et al.*²⁴ designed a mechanical thumb. It consists of a sleeve attached to the casing of the pressure tester spring so that it remains stationary when the spring and the rod are compressed. When the sleeve touches the sample, a light goes on indicating that the sample has been compressed to a certain point..

The methods of texture measurement described above alter the food sample being tested so that it cannot be returned to a production batch. These tests can at best be applied on a representative sample.

In some fruits and vegetables, as there is correlation between colour and texture, colour might be used as an index of texture. Spectrophotometric measurement of residual green pigment in peaches and apricots has proved to be the most satisfactory method of measuring the ripeness of these fruits.^{24a}

B. Physical and chemical methods

Moisture (100—per cent total solids) or the total solids is a useful index particularly in the case of vegetables for deter-

mining tenderness at the time of maturity. In the case of sweet corn, a moisture content of about 80 per cent is too watery, 75 per cent gives a product suitable for being graded as Fancy or Grade A, while corns having a moisture content of less than 65 per cent is so starchy that it is on the standard-substandard level. Moisture can be determined by drying the prepared samples in a vacuum oven at 60°C for 6 hr or longer until there is no further weight loss²⁵. Rapid methods for the determination of moisture are based on distillation using immiscible solvents (30 min) and use of infra-red moisture oven (10 min).

Determination of insoluble solids is more a measure of texture rather than an index of maturity. From the prepared samples, soluble solids are leached off and the residue is dried in an oven which provides a measure of the insoluble solids content.

Alcohol insoluble solids (AIS) content has been successfully applied for determining the quality of canned corn and peas. By this procedure, salt, sugar and other alcohol soluble solids are extracted so that the residual dried material contains mostly the highly polymerized carbohydrates such as starch, hemicellulose, cellulose, pectin, crude fibre and alcohol insoluble proteins. Lower alcohol insoluble solids content indicates less maturity and better suitability for purposes of canning. In Grade C cream style corn, the weight of AIS of the washed, drained material should not exceed 27 per cent by weight of such material. In Grade C canned whole kernel corn, the limiting line for AIS is 27 per cent of the drained weight. In Grade C canned peas, the AIS of early type of peas are not more than 23.5 per cent and of sweet type peas not more than 21 per cent²⁶. The procedure for determination of AIS is given in A.O.A.C.²⁵ The AIS test has been shown to be more accurate for canned peas and the tenderometer test for fresh peas.

Fibre content: Vegetables like French beans, green beans, waxed beans become more fibrous with maturity. The A.O.A.C. method of determining the fibre content involves digesting the prepared sample first with 2 per cent solution of sodium hydroxide, and subsequent treatment of the residue obtained with 2 per cent HCl. The acid digested sample is strained, washed, dried and weighed. Waxed beans containing more than 0.15 per cent fibre are considered substandard. Kramer *et al.*²⁷ made use of a more simplified method which consisted of blending 100 g of the pod with 200 ml of water in a Waring Blendor for 5 min, straining the blended material through a 30 mesh monel metal screen, washing the residue with water until the fibrous material is clear, and drying the residue at 100°C for 2 hr. As against 0.15 per cent noted by the A.O.A.C. method, the yield by this method was 0.1 per cent.

Sugar: Acid ratio is an important criterion from the stand point of taste appeal, and more so in the case of juices. For quality control purposes, sugar: acid ratio is the ratio of sugar value as determined using a refractometer to the grams of acid content as determined by titration. The ratio is placed at 40:1 for apple products and 10:1 for orange juice⁸. Sugar: acid ratio cannot, however, be applied to tomatoes as the acidity varies from season to season (June to August crop being more sour as compared to winter and early summer crops) and from different growing areas. pH control is more important than acidity to enable the tomato products to be processed as a fruit.

Brine floatation method has been made use of for tenderness-maturity grading of peas used for canning.²⁶ Shelled peas are floated in brine and the number of floaters and sinkers are recorded (Table 4). The method is rapid and simple, and provides

TABLE 4. *United States Standards for grades of canned peas (Maturity and Tenderness)*²⁶

Sweet Peas (Wrinkled varieties)	Alaska or Smooth Seeded Peas (Early peas)
Grade A (Fancy grade)	
Not more than 12% by count of peas will sink in a 11% salt solution and not more than 2% will sink in 13% salt solution	Not more than 20% by count of peas will sink in a 11% salt solution and not more than 2% will sink in a 13½% salt solution
Grade B (Extra standard)	
Not more than 15% by count of peas will sink in a 13% salt solution and not more than 4% will sink in 15% salt solution	Not more than 30% by count will sink in a salt solution of 13½% and not more than 8% will sink in a 15% salt solution
Grade C (Standard)	
Not more than 10% by count will sink in a salt solution of 15%	Not more than 10% by count of peas will sink in a salt solution of 16%

Brine Densities used for Peas and Lima Beans
(using a canner's salometer scale)²⁸

Peas

30° to 36°S for No. 1 Fancy
35° to 42°S for No. 2 Choice
38° to 46°S for No. 3 Standard and larger

Lima beans

First separation: 43-47°S
Second separation: 47-60°S
Third separation: 60-70°S

not only a measure of average quality but also uniformity. In addition to peas, the method has been applied for maturity grading of lima beans and water chestnut.^{28,29}

Soluble solids content indicates the maturity of the sample. In fruits, higher soluble solids content indicates increased ripeness, as well as sweetness of the sample, while with vegetables, and more so with starchy ones like peas, beans, corn etc., higher soluble solids content indicates less maturity (tenderness) and more sweetness. From the quality control point of view, soluble solids content is usually a value obtained by the use of Abbe or a hand refractometer with the assumption that the soluble solids consist entirely of sucrose. For determining tomato solids in different tomato products, the revised National Canners Association Tables should be referred to.³⁰ Brix hydrometer may also be made use of for determining soluble solids in juices. Appropriate temperature corrections should be applied to the determined value.

Acidity, which is a measure of sourness, is important from the stand point of flavour and the wholesomeness of the processed products. The titratable acidity indicates the sourness while the hydrogen ion concentration or the pH is more important from the processing point of view.

Size Grading

Size grading of fruits and vegetables is important from the processing point of view. Beans, peas and potatoes are graded by the size; apricots, peaches, brussels sprouts and sweet corn are graded by the narrower diameter; cherries either by sieve size or by weight per 100 fruits and tomatoes by the widest diameter perpendicular to core.

Bulk density which is a measure of weight of the substance contained in a known volume gives an indication of fluffiness, compressibility or overrun. Its

determination is useful in determining the size of the package required. For example, freeze dried products have less bulk density as compared to hot air dried products.

Flavour Characteristics

Unlike colour and texture, flavour is difficult to assess objectively. Since flavour is a physiological sensation, it is by definition subjective, and therefore not amenable to objective measurement. Basic characteristics of taste like sweetness, saltiness, sourness and astringency can be determined objectively but subtle odour characteristics are difficult to measure. On the contrary, some progress has been made in the detection of off-flavours like determination of enzyme activity as indicator of off-odour in frozen vegetables, estimation of diacetyl value as indicator of microbial load in concentrated orange juice, estimation of volatile acids, amines and succinic acid as indicators of off-flavour in stored fruit, etc. Although gas chromatographic methods have been developed to detect and estimate volatile flavouring components, they have remained largely as research and quality control tools. When it comes to consumer quality acceptance, there is still no substitute to sensory methods by panel. Panels may consist of trained individuals but groups are better because differences of opinion average out. Evaluation by individuals, no matter how experienced and trained, fluctuates. In the absence of a reference sample, the tendency is to score the samples critically when the average quality is good and too leniently when the general quality is poor.

The sensory tests are of two types—the difference test and the preference test. In the former, the object is to distinguish minor differences (sweetness in mangoes) and in the latter to indicate preference for a particular sample. The two types of tests may be combined to get a difference-preference test where each judge scores the

sample in accordance with the degree of difference of a particular taste or odour character but also indicates the sample which he prefers. It is essential that each judge scores the sample independently, preferably in a taste panel booth. The judges should be selected on the basis of their ability to detect differences and show consistency in their discrimination and comparison to panel average. Kramer and Twigg¹⁰ have discussed various methods of sensory evaluation. Score cards for two typical tests are given in tables 5 and 6.

Examination of Defects

Fruits and vegetables may be affected with fungal infections. The usual control procedure in the field is gross visual inspection for their presence. Mould, yeast and bacterial counts and microscopic examination for the presence of rot are useful. They are made after the raw produce has entered processing to check the effectiveness of preparatory operations. Some fruits and vegetables may exhibit physiological defects like shrivelled or discoloured peas, 'soft rot' in mangoes,

TABLE 6. Example of score card where samples are ranked in order of preference or intensity of difference (A Variables Procedure)

Instructions: Taste the five samples as much and as often as you wish, and arrange them in order of your preference, marking the sample you like best as one, and the one you like least as five:

Samples	Preference
A	
B	
C	
D	
E	

'water-core' in apples or 'black heart' in potatoes. Examination involves either visual observation or cutting the material at random. Birth and Norris²¹ proposed the use of a highly amplified light transmitting instrument for the purpose. Fruits

TABLE 5. Example of scoring card for consumer preference evaluation, using only one sample (A Variables Procedure)

Instructions: After tasting this product, indicate your degree of acceptance by marking the line in the proper place.

Like definitely	Like mildly	Neither like nor dislike	Dislike mildly	Dislike definitely

and vegetables may be infected with insects. If not adequate care is taken, the finished product may contain insect fragments, eggs or larvae. In addition to the visual observation in the field and before processing, it is a good practice to carry out occasionally micro-analytical examination for insect fragments as a part of quality control procedure. Details of this procedure are given in the A.O.A.C.²⁵ Pesticides may be used for the control of insects in the fields. But the pesticide residue should be within the prescribed limits.

Mechanical damage may occur due to hail-storm or during handling and transport which manifest as bruises, scars, lesions, split etc. Such defects might be either major or minor depending upon the end product. From a random sample collected, note the specified defects; determine whether they are critical, major or minor and decide acceptance or rejection.

In the acceptance inspection of the raw material, it is of utmost importance to determine the limiting attribute which determines the ultimate quality of the product. However, it would be worthwhile to carry out a few other tests also to serve as an index for acceptance or rejection of the lot.

Additional Quality Factors

Apart from the colour, texture and flavour—the organoleptic or sensory properties, three other important quality factors not always apparent to sensory observation are nutritional quality, sanitary quality and keeping quality. Nutritional quality which includes specific vitamins, minerals or other nutrients can be assessed by chemical, instrumental or biological methods. Sanitary quality usually is measured by bacterial, yeast, mould and insect fragments count etc. To determine the keeping quality or storage stability, accelerated storage tests like extremes of temperature, humidity, or other variables are used to

hasten developing quality defects in a short time. Accelerated storage tests must be chosen with considerable care since an extreme temperature or other variable frequently will alter the pattern of quality deterioration.

Apart from the sensory properties, each product has come to be associated with specific quality attribute(s) which the consumers expect. For example, cloudiness or turbidity is desirable in the orange juice, pineapple juice and tomato juice and it is a quality attribute, but apple and grape juice must be crystal clear for highest quality. Orange squash must be cloudy but lime juice cordial must be crystal clear.

Quality Standards

Although it has not come into practice in our country because of nonavailability of a wide choice of materials used in processing, it is a good practice to have a specification for each ingredient. Specification is a technical document used as the basis for commercial transaction. The standards for a material is dependent on the product in which the material is used and on the manufacturing process. Standard for each ingredient varies and has no universal application. The specification should be realistic. The tolerance limits should be set down. The specifications should include the following:

- (a) Identity—definition of the ingredient or material, source, any variation in composition etc.
- (b) Purity and composition: (i) Chemical e.g. moisture, total solids, fat, protein etc., dye content in colour, etc., (ii) Physical: size, colour, texture, viscosity etc., (iii) Micro-biological—filth tests from the hygienic point of view.
- (c) Packaging: Size and the type of package to be used.
- (d) Transport and schedule of supply.

Each processing unit has its own manufacturing standards to ensure excellence of its products. Standards laid down by the Indian Standards Institution and Trade Standards are standards adopted on a voluntary basis to assure acceptable quality and to prevent the lowering of standards of quality produced by the industry as a whole. The Government standards (F.P.O. and P.F.A.) are mandatory standards laid down to protect the health of the consumer and prevent deception. In addition to these, products meant for export should meet the standards prevalent in the importing country.

Sampling

In the evaluation and control of quality of fresh or processed products, it is not possible to examine each unit. Hence a representative sample is made use of. Statistically, sampling may fall into two categories—(i) random (where every individual unit has an equal chance of being chosen for a sample), or (ii) biased (where some units are more apt to be chosen than others). Sampling must enable rejection of lots sampled if they do not pass rigidly established quality levels. In such cases, simplified procedure referred to as 'sampling by attributes' may be used. For example, raw materials may be sampled for critical defects which would render the finished product unsaleable, such as mould, yeast and bacterial count of tomato which could not be entirely eliminated from the finished product.

In the sampling, errors must be established for each commodity at the point of inspection in terms of standard deviation. Since many processed products are handled in cases, sampling plan must take into account as to how many units drawn from how many cases will constitute the most economic sample. For more detailed information, the readers may refer to the chapter on 'Acceptance sampling and

Inspection' in the book on 'Quality control for the Food Industry'¹⁰.

In-plant Quality Control

To maintain the quality of a processed product, a systematic control programme is essential. This programme is dependent upon the quality demanded and the price which the customer can afford to pay. In the processing plant, to meet the quality specifications and market demands quality control testing must start with (i) acceptance sampling and testing of raw materials, (ii) process control and (iii) examination of finished products. These aspects are discussed below.

Acceptance Inspection

The criteria that determines the quality of the fruits and vegetables are size, shape, colour, texture, odour, taste and freedom from defects. Acceptance inspection is the most important part of the quality control system. At this point, the processor has the opportunity of rejecting unacceptable material. It would also help to determine the processing method to get the end product of desired quality.

The raw materials which make up the product may be classified into major and the minor. For example, in the preparation of tomato ketchup, tomato juice or puree is the major raw material. Other raw materials which make up the product are sugar, salt, vinegar, spices, colour etc. The raw materials used should be tested in relation to their contribution to product quality. The major raw material(s) should be given priority attention. Some of the raw materials like spices, fats, colours and flavours are likely to deteriorate during prolonged storage. Some may require special type of storage facilities. Such materials should be analysed at intervals to ensure that on preparation, they yield product of desired quality.

The various parameters developed for testing the quality of fresh fruits and vegetables were discussed in the previous pages. A few examples of acceptance inspection are given in tables 7 and 8.

Process Control

Process control must relate the results of processing to the tests performed on raw materials and meet the standards for the finished product. The manufacturing process, more so, where a batch process is operated, may cause considerable variation in the quality of the finished product. It is, therefore, essential to instal suitable testing procedures during the process.

In planning a process control, the sequence of steps in the process should be drawn preferably with the help of the flow-diagram. Alternative processes and materials should be considered at this stage. The critical points in the process which

TABLE 7. *Acceptance inspection of fruits^a*
(Peaches and Apples)
(for canning, freezing, and beverages)

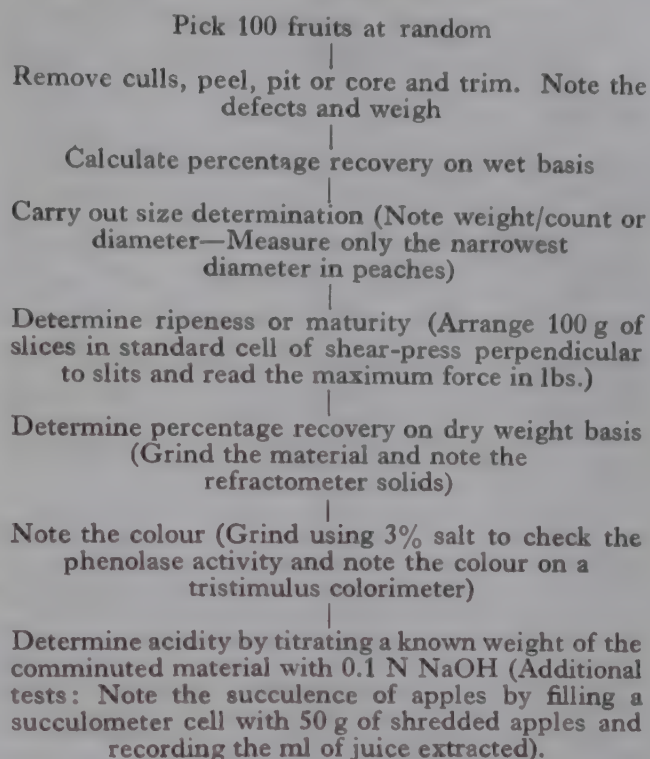


TABLE 8. *Acceptance inspection of vegetables^a*
(Potatoes, peas and cauliflowers for canning, freezing and drying)

Potatoes	Peas	Cauliflower
Pick 5-10 Kg ↓ Remove culls, peel and trim the defects. Note per cent recovery on wet basis ↓ Determine maturity by floatation in brine ↓ Rapidly dry in an infrared moisture balance, note the dry weight and calculate the percentage recovery on dry weight basis if intended for dehydration ↓ Determine firmness using shear press^a ↓ Determine succulence using succulometer^a	Pick 5-10 Kg ↓ Shell the pods, separate the seeds, remove the diseased or damaged seeds, weigh and note per cent recovery on wet basis ↓ Size grade by passing through sieves No. 1 (9/32" perforations) No. 2 (10/32" ") No. 3 (11/32" ") No. 4 (12/32" ") No. 5 (over runs) ↓ Determine maturity in a tendrometer (A reading of 95-105 is suitable for quick freezing and between 115-125 for canning) ↓ Determine percentage recovery on dry weight basis as in potato if intended for dehydration ↓ Determine the succulence using a succulometer	Pick 5-10 heads ↓ Remove the leaves, separate the good florets from the defective ones and weigh. Note the per cent recovery on wet basis ↓ Note the diameter of curds ↓ Determine compactness of florets visually using reference photographs to get an idea of ripeness ↓ Determine per cent recovery on dry weight basis as in potato, if intended for dehydration ↓ Note the colour by comparing the floret surface to reference photographs

^a—See acceptance inspection chart of peaches and apples for details

bring about alterations that reflect in the quality of the finished product should be defined and attention concentrated on these. Taking pineapple processing as practised in India, process quality control is illustrated.

The critical points in the process (Fig.1) are: grading of fruit for size and maturity (1), slicing (2), sorting of slices (3), can filling (4), syrup composition and temperature of filling (5), exhausting (6), can closing (7), processing (8), and cooling (9). In the juice line, blending (10), preheating (11) and filling (12) are the additional

critical points to be considered. Production schedule is given in Table 9.

Grading: Size and maturity grading of pineapple is very important. Sugar content has been found to increase from 4 per cent to a maximum of 15 per cent during the last two weeks of development. Fruits harvested from the plant prior to optimum ripeness will be of inferior quality. The stem of the plant which serves as a repository for starch contains a large amount of it. The fruit contains only traces of starch during early growth but none at maturity. During the growth of the fruit, relatively

FIG. 1

Flow sheet of Pineapple Processing

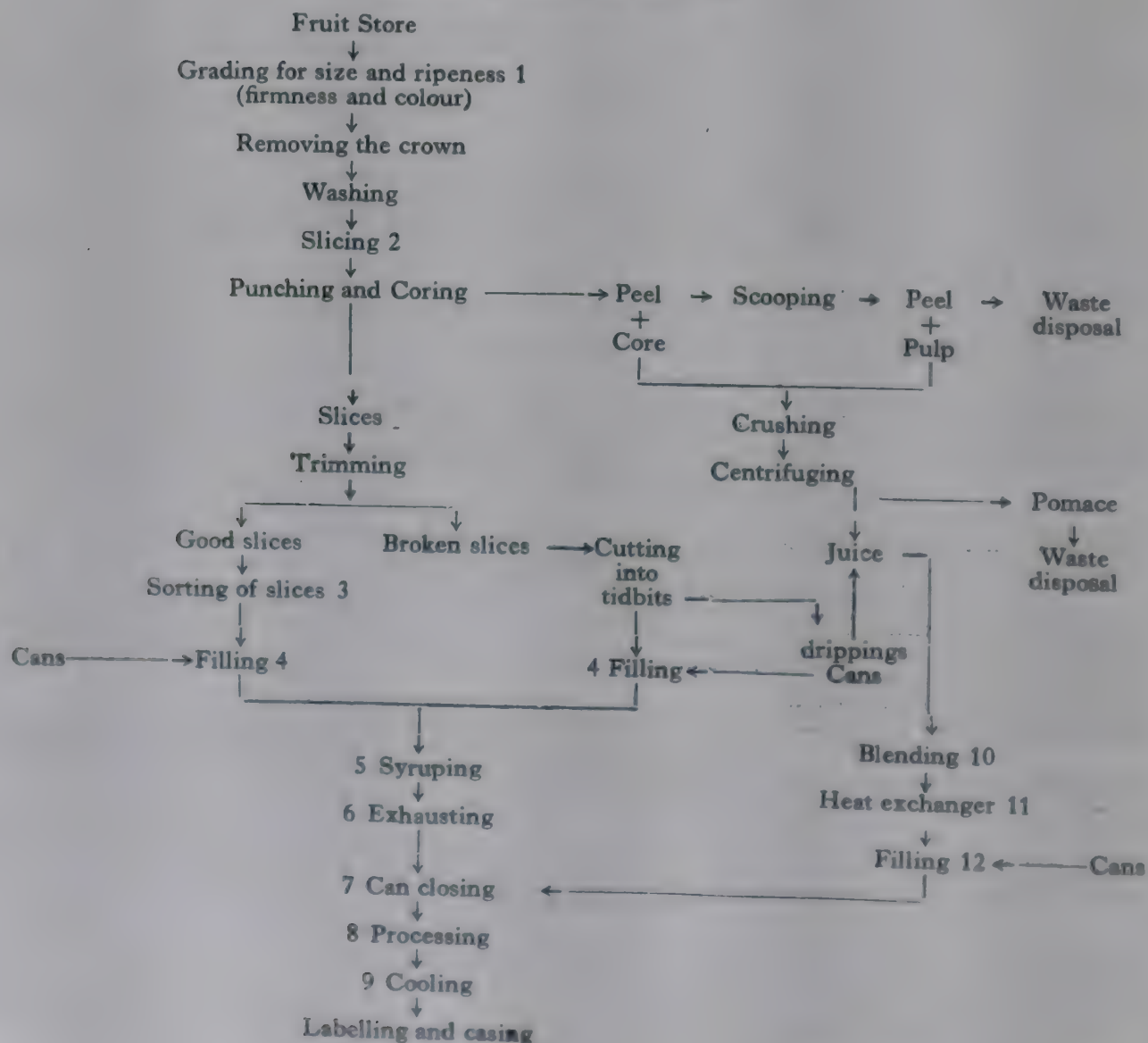


TABLE 9. *Production schedule for canned pineapple products*

3,500 A 2½ cans per shift of 8 hrs.		
Weight of pineapple	...	5 tonnes
Size of washing tanks	...	5' × 2.5' × 3.5' — 2 Nos.
Washing time	...	5 min
No. of canning lines	...	One
Can seamer speed (M.B. 1)	...	12 cans/min
Fillin weight of fruits into cans	...	540 g
Syrup composition	...	30% sugar* + 0.25% citric acid
Syrup temperature	...	190°F
Steam exhausting	...	12 min
Closing temperature	...	170–180°F
Retort capacity	...	180 cans/charge
No. of retorts	...	2
No. of charges per shift	...	10 each
Maximum retorting capacity per shift	...	3840
Standby capacity	...	360
Retort operating cycles		
Loading	...	5 min
Come up time	...	5 min
Sterilizing time	...	15 min—juice 25 min—slice
Unloading time	...	7 min
Total cycle time	...	32–42 min

* Net contents of an A 2½ can is 850 g consisting of 540 g slice and 310 g syrup. Equilibrium Brix in the product should be 20°. TSS content in the fruit varies from 15–18%. Taking the TSS as 15%, sugar content in the fruit is $\frac{15}{100} \times 540 = 81$ g taken as 80 g.

TSS required in the net contents is $= \frac{20 \times 850}{100} = 170$ g. Therefore sugar required is $170 - 80 = 90$ g/can which must be present in 310 g of syrup.

Therefore strength of the syrup required is $\frac{90}{310} \times 100 = 29\%$. Hence a 30°Brix syrup containing 0.25% citric acid is used.

small amounts of sugar are stored in it, but there is a rapid accumulation of sugar within a short period of normal ripening. The sugars are derived from the starch previously stored in the stalk.^{32,33} Pineapples harvested green do not, therefore, develop normal sugar content during subsequent ripening. For canning or for consumption immediately, the fruits must

be ripe before harvest. The stage of ripening is judged either by snapping of the fruit with fingers or by noting the skin colour. At least 20 per cent of the bracts should be of orange colour. At this stage, the fruit becomes less angular above the eyes and the ends of the bracts which project at the eyes, and dry up. In addition to the sugar content, slices from unripe fruits are white in colour, have unsightly patches and lack flavour.

Fruits having a weight of 1.5–2.0 kg are best suited for canning as slices as the wastage and the juice yield are more with smaller or bigger fruits.

Slicing: Filled weight of the slices is most important to get the desired drained weight. Accurate adjustment of the thickness of slice is necessary to get a fixed filled and drained weights.

Sorting: Into each can, slices having the same size and colour should be filled. The slices should be free from peels, eyes etc., as otherwise those defects would cause an ugly appearance to the canned product. Unripe slices would be whitish in colour and have patches which when present amidst fully ripe yellow coloured slices would be a defect.

Filling: The coefficient of variation of the weight of empty cans is generally about 4 per cent³⁴. This high variability presents the problems of check weighing. For instance, an average A 2 can without its lid weighs 3.0 oz. but about 1 per cent of cans may weigh 3.3 oz. or more and thus an addition of 0.3 oz. (equivalent to about 2.5 per cent of the filled weight of the fruit in the can) has to be added in order to safeguard against low filled weights due to variability in the weight of the containers.³⁴

The minimum filled weight of slices into an A 2½ can to give an adequate drained weight in the finished product is

540 g. The target fill on which the costings are based is 550 g. If the average filled weight rises to 570 g due to inattention, the yield of slices and tidbits per tonne of fruit would be 480 cans instead of 500. This results in an increase in the raw material cost of the product by 4.0 per cent which represents an avoidable loss of Rs 30 per tonne of fruit processed or Rs 150 per shift. On the other hand, if the filled weight falls down to 520 g, the company would be making an undesirable additional profit of Rs 150 per shift to the dissatisfaction of the customers.

In addition to check weighing of each can, it is desirable to take out cans every 15 or 30 min, weigh the can contents to the nearest 5 g and the results plotted on a chart which is provided with a maximum and minimum line and will show any tendency of the weight to drift from the standard.

Trouble tends to arise in the filled weight of fruits and vegetables when under ripe fruit and more particularly the fruits of large unit size are being filled. Adams³⁴ states that in an examination of Golden Plums canned in A2 cans, about 5 per cent of the cans were under filled and about 8 per cent of the cans were above the prescribed limit.

Syruping: Syrup is usually prepared by boiling water, sugar and citric acid in steam jacketed kettles, then strained and filled into cans. The strength of the in-going syrup is designed to give a cut out Brix 20°. From the foot-note in Table 9, it will be seen that the strength of the covering syrup required is 30° Brix. If the strength raises to 35° Brix, an extra 45 kg of sugar would be required for canning of slices and tidbits from 5 tonnes of fruit. Taking the price of sugar as Rs 5 per kg, the additional cost of sugar would be Rs 225. Moreover, use of higher strength of syrup would cause leaching out of more water from the fruit

for equilibration and may result in decreased drained weight.

Exhausting: Periodic check should be made to ensure that the nacs coming out of the exhaust box have attained the desired can centre temperature.

Can seaming: In the canning of fruits, or as a matter of fact, any product, can seaming is a very important step. Usually, the mechanic adjusts the seamers whose real value lies in his mechanical skill. He has to interrupt his regular work to check the seam dimensions at regular intervals and may overlook at times. The process control personnel should undertake to check the seam dimensions at regular intervals.

Processing: The time and temperature of processing is manually controlled by retort operators. Installation of temperature recorders would provide a record of the process given. The process control personnel have to occasionally check the accuracy of the recorder with that of mercury-in-glass thermometer.

The retort operators should ensure that crates of unsterilized cans are kept separate from sterilized cans at all times. The use of tags or tapes which change colour on processing provide a visual aid. Above all, the knowledge, trustworthiness and reliability of the retort operator, however, remain supreme.

Cooling: Cans should be thoroughly cooled to avoid over cooking. Even good cans may be subject to micro-leakage during cooling after processing. Regular checks should be made on the cooling water and adequate chlorine levels should be maintained. With 0.5—5.0 ppm of free available chlorine, provided that the pH of the water is at or slightly above 7.0, the bacteriological quality of water should be satisfactory and there should be no appreciable corrosion of cans. Chlorination of water is all the more important in the cooling

of low and medium acid foods like vegetables and tomato products. With satisfactory chlorination, although spore formers may survive, the total counts on nutrient agar at 30°C may be expected to be less than 50 per ml. In addition to cooling in good quality water, cans should be dried before handling, as otherwise leakage can occur. Incubation at 30°C has been reported to be better than at 37°C³⁵.

Labelling and packaging: In the processing of pineapple, simultaneously three types of packs viz., slices, tidbits and juice are packed. Lids having the code for one product should not be mixed up with the others. In addition to correct labelling, excess of paste or glue should not be applied. If wooden cases are used for packing, damage or puncture of the cans should not occur during nailing.

Juice: The factors which determine the quality of juice are sugar-acid ratio, pulp content, filling temperature and filled weight, which should be controlled.

Finished Product Inspection

The object of finished product examination is to conform that the other controls have operated properly and that the product conforms to specifications. If the finished product is faulty, nothing can be done short of rejection. Inspection of the finished product should be reduced to the minimum level depending upon the confidence gained by rawmaterial and process controls.

In the examination of the finished product, number of samples taken should show up any possible defect existing in the previous controls. As the acceptance inspection and process control becomes effective, sampling frequency becomes gradually reduced. At least there must be one sample from each batch of raw material and two cans must be taken from each retort load—one for incubation and the other for quality checking. The points for consideration

are (i) the external appearance of the can; (ii) net weight; (iii) vacuum; (iv) drained weight; (v) internal appearance of the can; (vi) number, colour, texture, defects, if any and taste and flavour of slices and (vi) colour, clarity, total soluble solids, acid and taste and flavour of syrup.

Process Control Staff

Quality control staff should consist of trustworthy and knowledgeable persons having a searching bent of mind. The process control checks required in the processing of pineapple are (i) size and maturity grading, (ii) adjustment of the thickness of slices, (iii) check on preparation and filling slices of uniform colour into cans, (iv) check weighing of cans, (v) adjustment of strength and temperature of in-going syrup, (vi) temperature after exhausting, (vii) can seam checking, (viii) process schedule check and (ix) sampling. Four or five people, apart from the laboratory staff, should be able to do this.

Score Cards for Assessment of Quality

Fruit and vegetable products, unlike Prepared food products such as confectionery, cannot be produced so as to conform to a precise specification. Each fruit may vary in colour, texture and flavour according to the season, soil, variety, ripeness etc., a few of which the canners may be able to exercise efficient control. Wide differences occur not only between batches of fruit but also within batches. Only in the case of peas, it has been possible to lay down with precision maturity standards by the use of tenderometer or maturometer, but similar specifications have not yet been developed for other vegetables or fruits.

Quality is easier to perceive than to define. Only in U.S.A. and England score card systems of judging quality have been put into practice. Quality grading is intended primarily to stress factors which

influence sales. In the English system, there is a single card for all fruits and two cards for vegetables.³⁴ The principle behind the method used is to award points for colour, texture, absence of defects, size grading and flavour. The maximum score for these five items is 100. Samples scoring 90 points or more are classed as grade A,* those with 80-89 points as grade A, 70-79 as grade B, and less than 70 as substandard. In addition, there is a minimum score in each item required for each grade, these being 80 per cent of the maximum possible score for grade A,* 70 per cent for grade A, and 60 per cent for grade B. In this way, a sample may fail to a slight degree in one item provided the deficiency is made good in another. In the American system, a separate score card has been drawn for each fruit and vegetable. The relative scores for many of the fruits and vegetables are shown in Table 10. These grade standards are usually set up on a 100-score basis with a certain portion of score assigned to each of a number of factors. For example, the U.S. grade for pineapple juice assigns 40 points to the defects factor, 20 points to colour and 40 points to flavour for a possible total of 100. For tomato juice, on the other hand, the factor of defects is assigned only 15 points with 30 for colour, 40 for flavour and 15 for consistency. In general, a total score of 90 to 100 indicates top grade (A), 80 to 89 intermediate grade (B), and 70 to 79 the standard grade (C), although these may vary considerably for individual products. There is also a limiting rule for some of the important factors which means that even though a sample scores 90 or better, if a single factor is sufficiently poor, the grade must still be reduced. The Indian Standards Institution specifications for scoring fruit and vegetable products are given in Table 11.

The score card system is empirical and may become highly subjective in the hands

of an inexperienced person. Adam³⁴ has discussed the method of grading using score card. Although many reflectance instruments have been developed for measurement of colour, they have not found general use. Nearly all fruits show too high a variation of colour over the surface of each fruit and also between one fruit and another for objective methods to be workable. Judges for colour are advised to analyse their impressions in terms of hue, tint, brightness and uniformity and then allocate the score on a basis of the failure to reach the ideal standard in each of these impressions³⁴. Scoring of texture, which includes wholeness and tenderness, may be based on the percentage of units showing various kinds of faults or, in the case of peas, on the judges' award for firmness of skin and flesh, and degree of mealiness of the peas. Absence of defects includes freedom from skin blemishes (which are scored according to their severity and the proportion of fruits or vegetables affected) and extraneous matter (for which penalties are awarded on a grade scale). Size grading for the larger fruits and vegetables is judged on weight rather than on diameter. The ratio of the weights of the smallest and largest units, or of the smallest 5 per cent and the largest 5 per cent of the total count, is generally taken. Flavour is chiefly dependent on variety and maturity and is extremely variable. Furthermore, scoring is highly subjective.

Sanitation and Health Problems in Quality Control

In the commercial manufacture of fruit and vegetable products, it is not only necessary to manufacture the product which would satisfy the consumer but also safeguard the health. The production of each commodity is affected by the conditions of cultivation, time of harvest and susceptibility to diseases, pests etc. This in turn may affect the ultimate product. Fruit

TABLE 10. *Relative importance of factors involved in U.S. Dept. of Agriculture Standards for processed fruit and vegetable products*

Product	Absence of defects	Colour	Flavour	Character	Consistency	Uniformity	Texture	Tenderness and maturity	Cleanliness of liquor
Apples	20	20	...	40	...	20 siz.	...	...	...
Apple Butter	20	20	20	20 fin.	20	...	...	...	...
Apple Juice	20	20	60	...	...	...	...	...	...
Apple Sauce	20	20	20	20 fin.	20	...	...	...	...
Apricots	30	20	...	30	...	20 siz.	...	...	...
Asparagus	30	20	...	...	...	...	...	40	10
Green & Wax Beans	35	15	...	...	...	...	...	40	10
Canned Beans	40	...	...	40	20	...	...	...	...
Cannellini Beans	25	35	...	30	...	...	...	...	10
Cauliflower	30	25	...	...	...	15	30	...	...
Cherries	30	20	...	30	...	20	...	...	...
Cherries	40	20	...	40	...	...	...	...	...
Corn	30	25	...	...	shape	15 siz.	30	...	...
Corn, Sweet	30	30	...	20	...	20 siz.	...	...	...
Corn, Sour	30	20	...	30	...	20 pits	...	...	...
Corn, Cream	20	10	20	...	20	...	...	30	...
Corn, Whole	20	10	20	...	...	...	...	40	10
Cranberry Sauce	20	20	20	...	40	...	...	...	...
Custard, Kadota	30	20	...	35	...	15 siz.	...	...	...
Canned Apples	20	20	...	40	...	20	...	...	...
Citrus Cocktail	20	20	...	20	...	20	...	...	20
Citrus Jelly	...	20	40	...	40	...	...	...	...
Citrus Preserve. (Jam)	20	20	40	...	20	...	...	...	...
Citrus Salad	30	20	...	30	...	20 siz.	...	...	...
Citrusfruit	25	25	...	25	(Wholeness 25)				
Citrusfruit Juice	40	20	40	...	...	...	...	...	...
Citrus Juice	20	40	40	...	...	...	...	...	...
Citrus Juice	35	35	30	...	...	...	...	...	...
Citrushroom	30	30	...	20	...	20 siz.	...	...	...
Citruses, Green	30	30	...	20	...	20 siz.	...	...	...
Citruses, Ripe	10	15	30	25	...	20	...	...	...
Citrus Juice	20	40	40	...	...	...	...	...	...
Citrus Juice con.	20	40	40	...	...	...	...	...	...
Citrus Marm.	20	20	40	...	20	...	...	...	...
Citrus	20	15	15	...	...	10	...	35	5
Citruses	30	20	...	30	...	20 siz.	...	...	...
Citrus Butter	30	20	30	...	20	...	...	...	...
Citrus	30	20	...	30	...	20 siz.	...	...	...
Citrus	30	10	...	...	...	...	...	50	10
Citrus, Field	40	20	...	40	...	...	...	...	...
Cucumber Pick.	30	20	...	...	...	20	30	...	...
Citrus	40	30	...	10	...	20 siz.	...	...	...
Citrus	30	20	...	30	...	20	...	...	...
Citrus Juice	40	20	40	...	...	20 siz.	...	...	...
Citrus	30	20	...	30	...	20 siz.	...	...	...
Citrus, peeled	40	20	...	...	...	20	20	...	...
Citrus, dr.	30	20	...	35	...	15	...	...	...
Citruskins and Squash	30	20	...	20 fin.	30	...	...	...	...
Citrusberries	30	30	...	30	...	10 siz.	...	...	...
Citruskraut	20	30	30	10 crisp	...	...	...	...	10 cut
Citruskraut, bulk	10	15	45	15 crisp	...	...	...	...	15
Citrusinach	40	30	...	30	...	20 siz.	...	...	...
Citrus. Potatoes	40	20	...	20	(Wholeness 20) (Drained Wt. 20)				
Citrusatoes	30	30	...	...	15	...	...	...	...
Citrusato Juice	15	30	40	...	...	...	...	...	...
Citrusato Paste	40	60	...	...	...	...	...	...	...
Citrusato Pulp—puree	50	50	...	...	25	...	...	...	...
Citrus. Sauce-Catsup	25	25	25	...	20	...	...	...	...
Citrusuli Sauce	20	20	20	20	...	...	...	...	...

Source: Compiled from The Almanac of the canning, freezing, preserving industries¹⁶

and vegetables may be contaminated with pesticide residues which might have a toxicological significance or affect the sensory characteristics of the product. Additives are being used either to improve the quality or to preserve the product. The permitted list of these additives are

being constantly revised based on the toxicological data that are accumulating.

Manufacturers should keep abreast of these changes. Coal tar dyes, among them azo dyes, are the most suspected ones. The list of permitted colours is shrinking year after year. The additives and more

TABLE 11. I.S.I. Specifications for scoring fruit and vegetable products ^a

Code No.	Product	Grade I				Grade II			
		Colour	Texture and uniformity of size	Taste and flavour	Absence of defects	Colour	Texture and uniformity of size	Taste and flavour	Absence of defect
IS: 2867—1964	Canned Mangoes	15	19	15	26	13	16	13	23
IS: 3880—1966	Canned Mango Pulp	15	15 ^b	30	15	13	13 ^b	26	13
IS: 2869—1964	Canned Orange Segments	15	19	15	26	13	16	13	23
IS: 2868—1964	Canned Pineapples	15	19	15	26	13	16	13	23
IS: 3245—1965	Canned Peas	11	23	15	26	9	20	13	23
IS: 3246—1965	Canned Okra (Bhindi)	12	26	11	26	10	22	10	23
IS: 3247—1965	Canned Bitter Gourd (Karela)	11	19	15	30	9	17	13	26
IS: 3248—1965	Canned Tomatoes	11	23	11	30	9	20	10	26
IS: 3881—1966	Tomato Juice	22	11 ^b	40	15	19	10 ^b	26	10
IS: 3883—1966	Canned Tomato Puree	45	—	—	30	39	—	—	26
IS: 3884—1966	Canned Tomato Paste	45	—	—	30	39	—	—	26
IS: 3882—1966	Tomato Ketchup	19	19 ^b	19	18	16	16	16	17

Code No.	Product	Grade I			Grade II		
		Colour and texture	Taste and flavour	Absence of defects	Colour and texture	Taste and flavour	Absence of defects
IS: 3500—1966	Mango Chutney	19	37	19	16	33	16
IS: 3501—1966	Pickles	19	37	19	16	33	16

IS: 4036—1968	Fruit Squashes	Maximum Minimum	Colour	Taste & flavour	Absence of defects
			25 20	50 40	25 20

^a Compiled from Indian Standard Specifications given in column 1, Indian Standards Institution, Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1.

^b Denotes consistency.

^c The fruit squash shall possess a good body, uniform colour, shall be free from defects and shall possess normal characteristic taste and flavour and shall score not less than 80 points. The maximum and minimum number of points scored by different factors shall be as above.

the coal tar dyes permitted in different countries vary. In the manufacture of products meant for export, the appropriate additive permitted in the country to which the product is exported must be used. With the ever increasing cost of tin containers, alternative packages are thought of. The package material used should not only meet the packaging needs but also safety requirements. For example, paraffin wax is generally considered as inert, safe and free from any hazard after ingestion. However, it was shown that some of the paraffin waxes may be contaminated with well known carcinogens, such as 3, 4-benzopyrene³⁶. This shows the utmost importance of an appropriate quality control check for any unsuspected health hazards.

The microbiological condition of the product governs the safety and keeping quality. Advances made in thermal processing have rendered the canned foods absolutely safe from food poisoning. Contamination might occur from raw materials, equipment, water, human beings etc. The construction of the buildings, walls, floors and ceilings should be such that they are not able to harbour microbial growth. Cleaning schedule must be drawn up to maintain the sanitary conditions. There should be adequate toilet and washing facilities. The design and installation of the plant and equipment, the provision for cleaning and sterilization of equipment, hygienic practices in manufacture and storage, and the pest control measures have been discussed in standard text books on plant sanitation. The measures taken should eliminate, or at least reduce to a minimum, possible sources of contamination with microorganism, whether they are likely to affect the keeping quality of the product or the health of the consumer. The measures should also eliminate possible sources of infestation or rodent contamination.

Quality Control Measures for Specific Products

Soft Drinks

Types

1. Ready to drink carbonated or still beverages with or without fruit juices.
2. Fruit juices.
3. To be diluted fruit juice squashes, crushes, barley waters and syrups
4. Fruit juice concentrates.

Quality Control of materials used

Water. Quality of water required for different fruit and vegetable products has been reviewed earlier in this journal³⁷. Phillips³⁸ has given the following standards for water to be used in preparing fruit juice beverages.

	<i>Maximum</i>
Alkalinity	50 ppm
Total solids	500 ppm
Iron	0.1 ppm
Turbidity	5.0 ppm
Colour	Colourless
Residual Chlorine	None
Odour	None
Taste	No off taste
Organic matter	No objectionable content

Price-Davies and McDonald³⁹ give the following basic standards for treated water.

Taste and Odour	Nil
Suspended matter	Less than 2 ppm
Colour	Max. 10 Hazen Units
Alkalinity	Max. 100 ppm as calcium carbonate (50 ppm for cola drinks)
Free chlorine	Less than 0.05 ppm
Iron or aluminium in solution	Less than 0.3 ppm
Nitrate	Max. 5 ppm
Bacteriological quality	Free from coliform bacteria

Treatments given are the following:

High purity water—'Polishing' filtration

Coloured or hard waters—Coagulation using ferrous sulphate or alum and lime particularly if softening is required. Treatment with lime converts the bicarbonate alkalinity into insoluble calcium carbonate which is precipitated with the sludge.



Chlorination using sodium hypochlorite or gaseous chlorine—To assist the chemical coagulation conditions and to provide an excess of chlorine sufficient to sterilize the water.

Dechlorination—To remove excess chlorine by filtration through carbon after filtration through sand.

'Polishing' filtration—Filtration through resin impregnated paper, candles or disks or porous porcelain candles.

In addition to the treatment suggested above for water which goes into the product, hot or cold water used for purposes of rinsing containers should have low total hardness which could be obtained by base exchange treatment. Water for boiler should be low in hardness, chlorides and dissolved solids. For plant sterilization, water should be not only low in hardness but also bacteriologically sound. These qualities could be achieved by passing water through ion exchange resins or by base exchange.

Carbon dioxide. Smell the gas, prepare some soda water and ask the experienced persons to test for any undesirable taints.

Sugar. It should be dry, free from foreign matter, and the solution should be neutral to litmus, clear and colourless. Price-Davies and McDonald²⁰ give the following microbiological standards for sugar suitable for high quality soft drinks.

(i) Nutrient agar—less than 400 colonies for 10 ml after 2 days at 37°C.

(ii) Wort broth—less than 20 colonies per 10 ml after 2 days at 33°C.

(iii) Osmophilic medium—less than 1 colony per ml after 2 days at 33°C.

Preservatives. Sodium benzoate and potassium metabisulphite are generally used. Add sodium benzoate to the batch prior to the addition of acid to avoid the less soluble benzoic acid coming out of solution. Sulphur dioxide is used in the form of sodium or potassium metabisulphite. Store in an air tight container and check for the sulphur dioxide content. Methods for the estimation of sulphur dioxide and benzoic acid are given in A.O.A.C.²⁵

Colours. Usually coal tar dyes are used in beverages. Check the colour for stability in the presence of sulphur dioxide, acidity and light. Check the colour of the sample from each batch with the previous batch. Dissolve the colour in distilled water in the same proportion as used in the finished beverage and compare with the colour from previous batch dissolved similarly to check for consistency in quality.

Acids. Citric acid is used as an acidulant in beverages. Phosphoric acid may be used in cola beverages. Ascorbic acid may be used for fortification.

Fruit juices. The juice used must be free from skin, cores, seeds and foreign matter. It should contain no added sugar, colouring matter, flavour, unpermitted preservative and possess natural bright colour free from any traces of browning. To check the brown colour formation, add alcohol to the juice in the ratio of 1:2, filter and measure the colour at 420 nm. The juice must be sterile and give a negative result when checked for yeasts by mixing one part of juice with nine parts of sterile 10 per cent w/v sucrose solution and

incubation at 26.5°C for 14 days³⁹. The absence of gas bubbles and a white deposit of yeast cells indicate a yeast free juice.

Check the stability of the cloud in the juice by incubating the sample at 26.5°C for 14 days and noting the physical condition daily.³⁹ Unpasteurized and incorrectly pasteurized juices become clear.

Tomato juice is highly susceptible to mould contamination. Make a Howard mould count.²⁵ Price-Davies and McDonald³⁹ state that the count should not exceed 15 per cent of the fields examined and according to F.P.O., 30 per cent.

Settled lime juice intended for preparation of cordial after filtration should give a sparkling clear product, possess a bright natural greenish yellow colour, full lime flavour free from bitterness, metallic taste or any off flavour.

Process Control

Carbonated Soft Drinks

Syrup base. Syrup base contains sugar, fruit juice flavouring compounds, acidulant, colour, emulsifying agent for cloudy product and preservative. In the preparation of the base, the ingredients should be weighed accurately and the mixing should be thorough. Analyses consist of determination of total soluble solids (TSS), acidity, pH, preservative and sensory evaluation to detect the correctness of colour and flavour but also to detect any off flavour.

Bottle washing. In India, the bottles are, invariably, reused. Hence bottles should be soaked in 2 or 3 stages in caustic (upto 2.5 per cent) detergent solution letting the temperature to gradually raise (upto 160°F). This step is followed by water washing, internal brushing, low strength detergent jetting, soft water jetting and final soft water rinsing.

Bottling. Two methods are followed. A known volume of syrup base is dosed into

each bottle and filled with carbonated water or alternatively syrup base is mixed with carbonated water, and then filled into bottles. In either of the methods, important check required is the level of carbonation. The level of carbonation may vary from 1.3 volumes (grape beverage) to 4.0 volumes (lime beverage). The 'volume' is defined as the amount of gas in millilitres that a given volume of water will absorb at atmospheric pressure (760 mm of mercury at 15.5°C). Solubility is dependent upon temperature and pressure. To measure the level of carbonation, determine the temperature and pressure of the gas in the bottle and consult the standard tables to convert these to volume of CO₂ gas.^{40,41}

Bottle closing. In India, crown corks either with cork liner or plastic insert are made use of. Accurate setting of the crown corking machine and replacement of worn out crowner throats are the important checks. Avoid over crimping and lacquer loss of the crowns.

Inspection. Empty bottles before they reach the filling head and filled bottles for height of fill, broken, chipped or contaminated bottles should be examined either manually or by electronic means.

Squashes, Barley Waters, Cordials and Syrups

The calculations involved in preparing the squash have been discussed earlier in this journal.⁴² The calculations for barley waters, cordials and syrups are similar. Test the product (TSS, acidity, colour and flavour) before filling.

In India, either fresh or chemically preserved raw juice is used in the manufacture of squashes. In U.K., to ensure stability of the fruit cloud, pasteurized juice is used and the finished product is homogenized and heated to 200-202°F in a flash heat exchanger, held for 30 seconds

and immediately cooled.^{39,43} Ranganna and Raghuramaiah⁴⁴ found addition of low density propylene glycol ester of alginic acid helps stability of cloud in orange squash.

During filling, weight and volume of fill are the important controls to be exercised. The closure used should be able to retain the SO₂ and prevent ingress of air.

Tests on the finished product are determination of volume of fill, TSS, acidity, preservative content, cloud stability, test for any sign of fermentation, and sensory characteristics (with reference sample).

Canned and Bottled Fruit Juices

Check the TSS, acidity, flavour and colour of the juice before packing. Adjust if necessary and then process. In India, the prepared juice is preheated in a heat exchanger to 175-185°F, filled into cans, sealed and processed in boiling water for 15 to 30 min depending on the size of the container.

In U.K., most of the juices are packed in bottles and some in tins. Two methods of pasteurization are practised.³⁹ In one, the juice is filled cold into washed and sterilized bottles, crown corked and raised to the pasteurization temperature of the particular product, usually in the range of 160-200°F for upto 20 min and cooled. In the more commonly practised method, the juice is flash pasteurized for 30 seconds at 200-202°F, filled into washed hot sterile bottles, crown corked, kept inverted to sterilize the crown cork and then cooled. If the filling temperature does not fall below 180°F and the temperature is maintained above 175°F for at least 2½ minutes, the product will remain sterile. No further processing is required and the bottle is cooled quickly to room temperature. The packed juice should not show any sign of spoilage on incubation for 14 days at 27°C (55°C for tomato juice).

The manufacture of citrus beverages and quality control have been dealt in an earlier paper in this journal⁴² and by Mathews and Gray⁴⁵.

Jams, Jellies and Marmalades

Jams, jellies and marmalades are products made from fruit, fruit pulp or fruit extract (jelly and jelly marmalade), sugar, acid, pectin where needed, colour and flavour.

To store fruits or pulps for use in the preparation of jams during off-season, they must be initially steamed or boiled to inactivate the pectolytic enzymes. Extracts of fruit for use in jelly making are not stable during storage as the pectin undergoes degradation. Sulphur dioxide content required to preserve the pulps varies from 1000 to 1500 ppm.

Pectin is generally sold on the basis of jelly grade (150-250 grade). One kg of 150 grade pectin will gel with 150 kg of sugar. Jams containing whole fruits (like strawberry, gooseberry etc.) and jelly marmalades which contain shreds are prepared using rapid or medium rapid set pectins to render uniform suspension of fruit or peel in the container. Such pectins are prepared by controlled deesterification. Procedure for determining the jelly grade of the pectin is discussed by Kertesz⁴⁶ and the I.F.T. committee on pectin standardization.⁴⁷

Citric acid is generally used as acidulant. In addition to control of acidity, the setting characteristics of jelly or jam is dependent upon pH. The normal pH range is 3.1-3.2 and the range may vary from 3.0-3.4. When the pH is low, it may be raised by the addition of alkaline salts such as sodium bicarbonate, sodium citrate, and sodium potassium tartrate.

It is always advisable to prepare a small test batch in the laboratory before manufacture on a large scale. Short boiling time is of utmost importance for the preservation

of colour and natural flavour of jam. Excessive boiling causes greater inversion of sugar. The boiling time for a batch size between 40 and 60 kg may vary anywhere between 5 and 15 min. The mixture is always boiled to a standard temperature of about 105°C (221°F) in the open pan when the soluble solids concentration would be around 70 per cent. After cooking, the jams should not be allowed to cool in the pan as otherwise inversion increases. Immediately after boiling, the jam should be transferred from the pan, filled into containers and cooled.

During the process of manufacture, quality control checks involved are determination of the end point, TSS, setting characteristics, filled weight, degree of inversion, acidity and pH.

During cooking, it is advisable to aim at an invert sugar content of 25-30 per cent as inversion may proceed till the product is filled and cooled. In the final product, the invert sugar content should be between 30-40 per cent, as outside these limits, crystallization may occur on standing.

Examination of the finished product should be made at least after 24 hr when the product would have achieved equilibrium. The tests include determination of TSS using an Abbe refractometer, acidity, pH on a sample blended with equal weight of water, degree of inversion of sugars, jelly strength, residual sulphur dioxide (if the product has been prepared from chemically preserved pulps), and occasional examination for mould count and presence of filth. Jelly strength can be checked using either F.I.R.A. jelly tester^{48,49} or Exchange Ridgelmeter^{47,50}. Soluble solids content and the temperature of filling (85°C) are relied upon for preservation of jams, jellies and marmalades. Overcooling before filling should be avoided. To determine whether spoilage is likely to occur during storage, incubate the sample at 25°C for 7 days.

Useful References

Several useful books on quality control have appeared. Important among them are 'Quality Control in the Food Industry' (3 volumes) edited by Herschdoerfer⁵⁵ and 'Quality Control for the Food Industry' by Kramer and Twigg^{3,10}.

For chemical methods of analysis, reference may be made to the Official Methods of Analysis by Association of Official Analytical Chemists²⁵. This volume also gives the methods for the determination of extraneous materials. Amendments to the test procedures are published in the Journal of the A.O.A.C. For day-to-day work, reference may be made to the National Canners' Association Laboratory Manual⁵⁴, the Chemical Analysis of Foods and Laboratory Techniques in Food Analysis by Pearson^{56,57}, Methods in Food Analysis by Joslyn⁵⁸ and Laboratory Handbook of Methods of Food Analysis by Lees⁵⁹. References for microbiological methods are: Canned Foods—An Introduction to their Microbiology (Baumgartner) by Hersom and Hulland⁶⁰, American Public Health Association Recommended Methods,⁶¹ the N.C.A. Laboratory Manual⁵⁴, the paper by Mossel⁶² on Microbiological Quality Control in the Food Industry which gives useful techniques and references and another paper by Mossel⁶³ on the assessment of the hygienic condition of food factories and their products and a recent discussion by de Figueiredo⁶⁴ on the usefulness and limitations of microbial indices for quality assurance. A Manual of Analysis of Fruit and Vegetable Products covering physical, chemical and microbiological methods is in press and is intended to provide as a day-to-day work book⁴¹. Progress made in the analysis of fresh and processed fruits and vegetables prior to 1960 have been reviewed by the author earlier⁶⁵. For advances made thereafter, the readers may refer to the

books mentioned above and biennial reviews on food which appear in the Journal of Agricultural and Food Chemistry.

Concluding Remarks

Quality control methods followed should be so designed as to discover the factors which control the ultimate quality of the product. Tests performed, be they chemical, physical, sensory or microbiological, should be of practical value. At times, a rough analysis obtained rapidly may be more useful than a precise value which takes long time to achieve.

Like production or personnel management, quality control is also a function of management. The yardstick of successful management is the profitability of the company. Sustained sales and consumer acceptance of the product is dependent upon the maintenance of quality or better still, improvement in quality. Fruit and Vegetable Processing Industry is beset with difficulties occasioned by the variability in the quality of the primary raw materials. Rigorous application of quality control measures would go a long way in reducing the cost of production and ensuring the quality.

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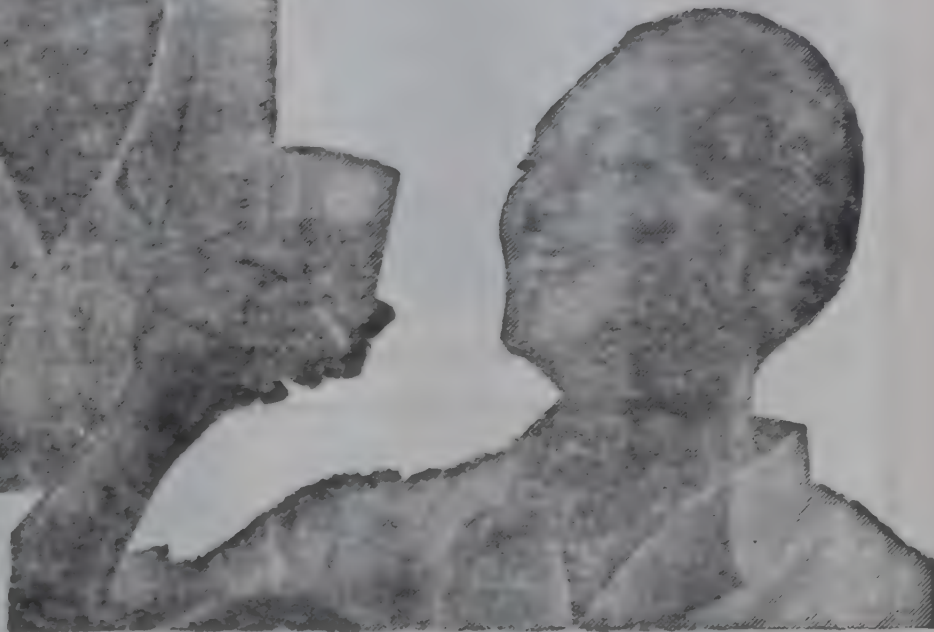
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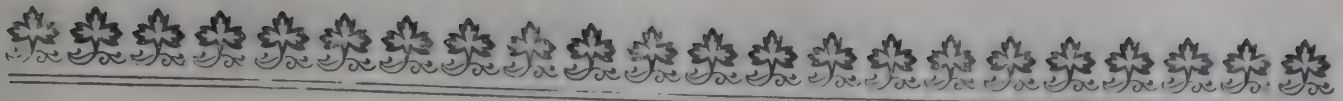
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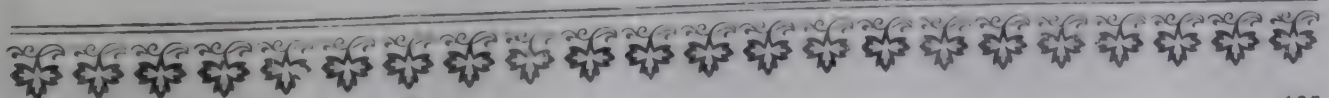
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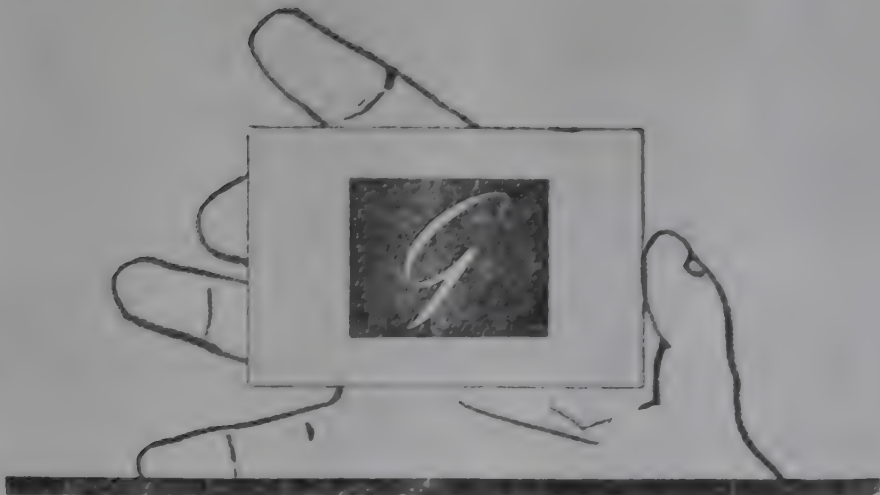
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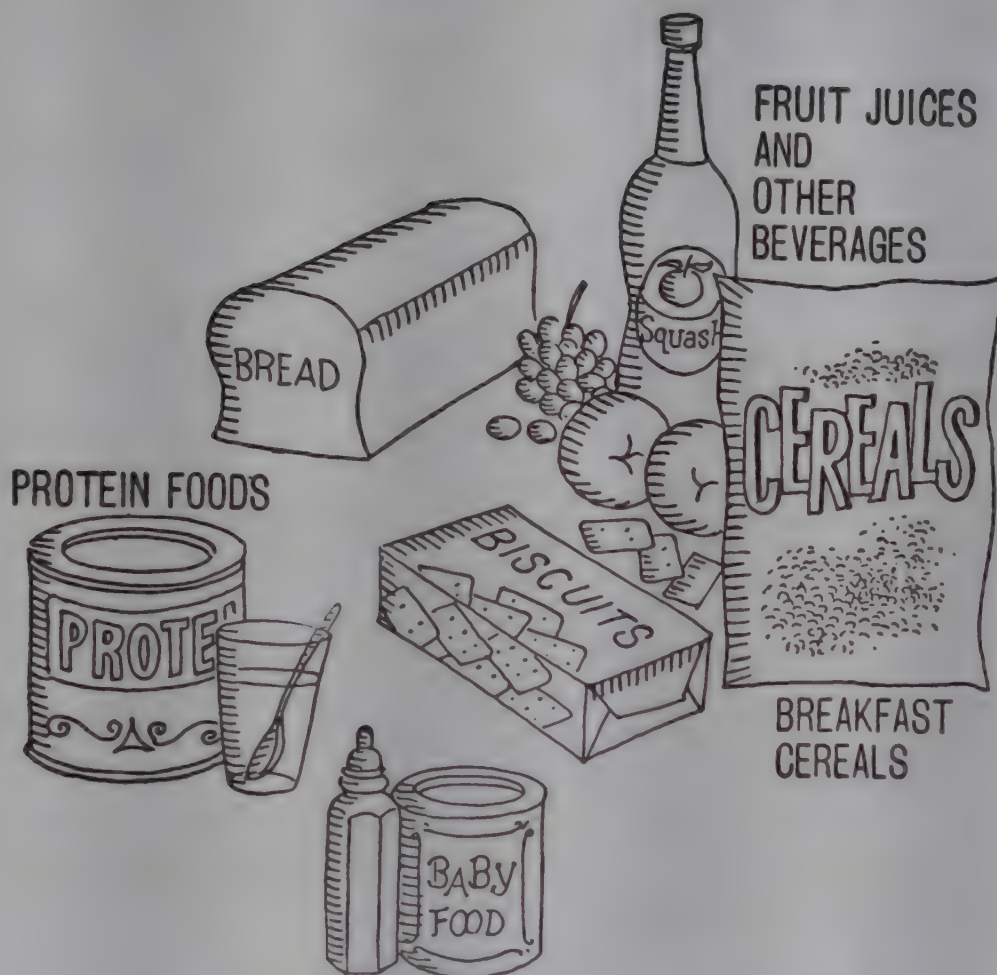
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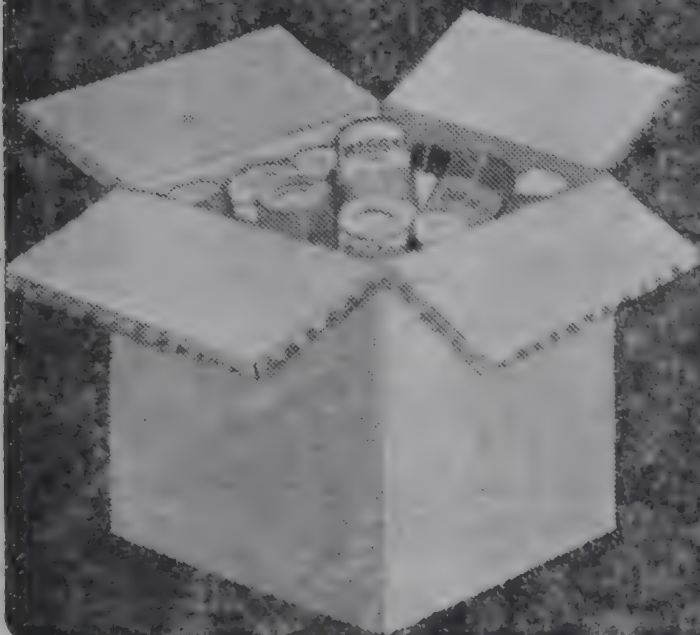
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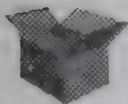
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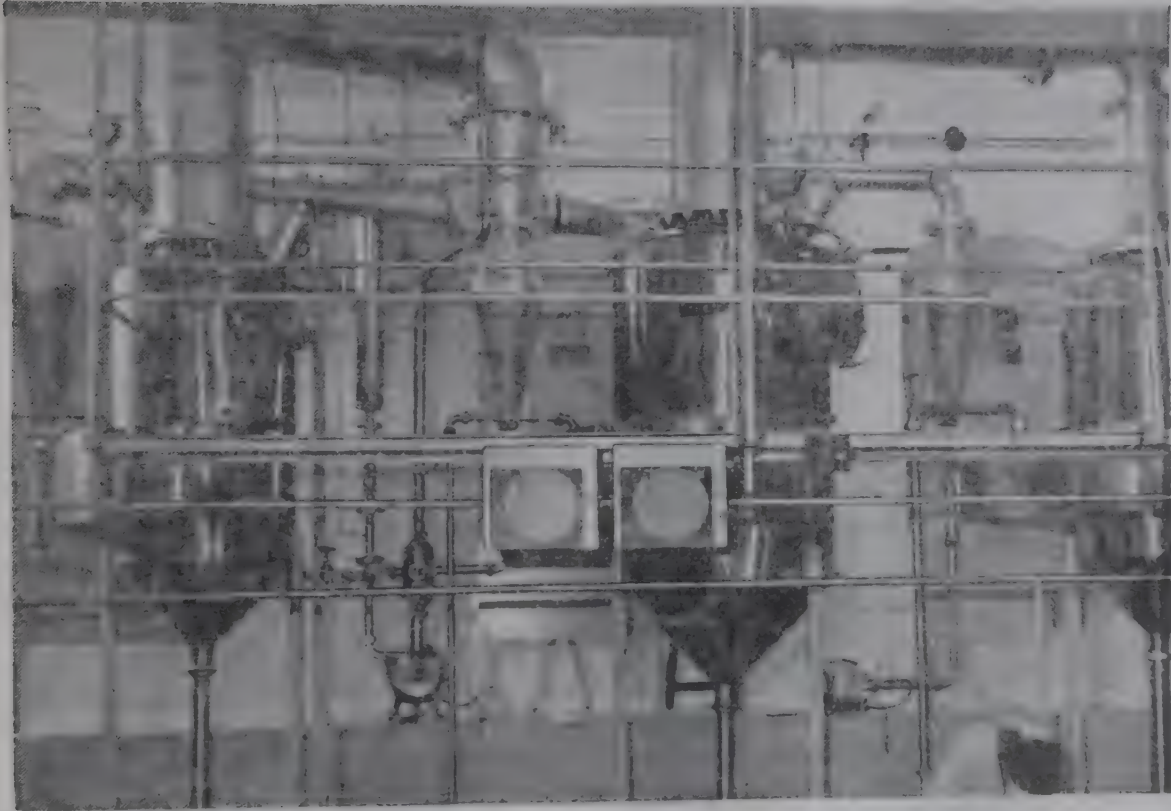
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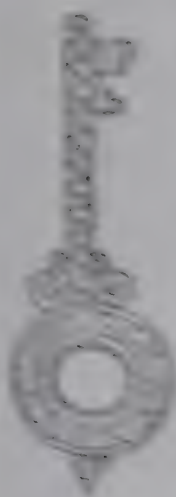
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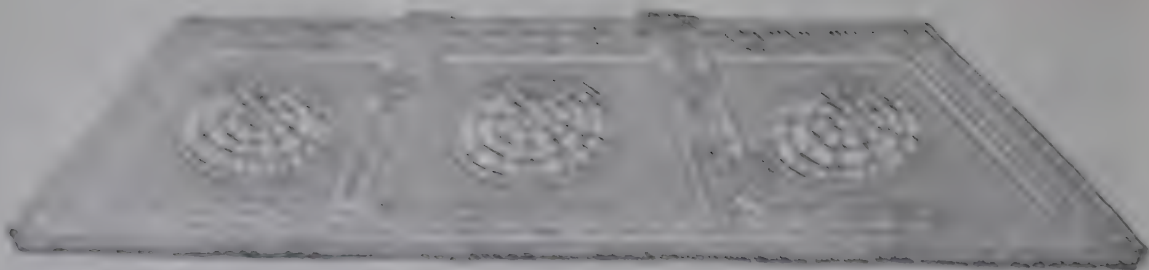
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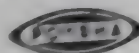
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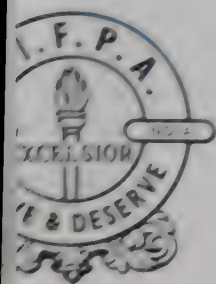
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MARCH—APRIL 1975

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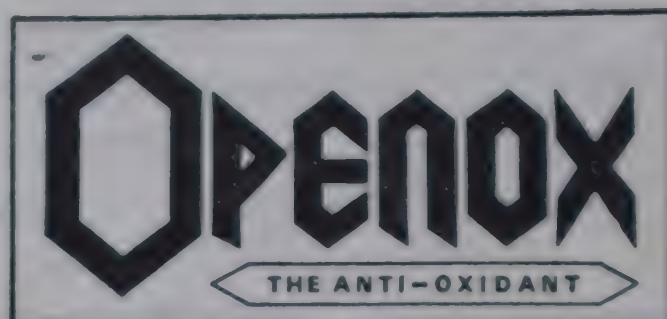
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Editorial

The import policy for the year 1975-76 has many welcome features. There is allocation of foreign exchange for accelerating the rate of growth in production for exports. The policy has provided for annual licensing instead of twice a year and also for automatic licensing for the Actual Users; replacing of traditional classification of 'priority' and 'non-priority' industries by a composite list of 'Select' industries; liberal facilities for small scale industries; additional allocation for import of raw materials and components; special assistance for export production and stream-lining and simplification of licensing procedures. Automatic licensing provides 100 per cent of the value of REP licence/release orders against exports during the preceding year. This enables manufacturer-exporters and export houses to make arrangements for imports to match export performance. Special Import Licence facility has been provided for import of raw materials and components for utilising idle and spare capacity. Under 'Conversion Deals', merchant exporters/actual users/export houses are allowed to avail the facility of import of raw materials and components to be re-exported after processing. Manufacturer-exporters will be permitted to utilise REP licences for import of non-permissible items to the extent of 10 per cent; exporters will have the facility of direct imports of canalised items under letters of authority. A new

classification of 'Select' industries has been introduced for actual user licensing. As per the 'automatic' licensing policy, all actual users whether included in the 'Select' list or not will be given AU licence for raw materials and components on the basis of preceding year's actual consumption or the value of AU and REP licence. Industries in the 'Select' list will also be eligible for 'supplementary' licence for raw materials and components. For the first time compulsory export obligation has been imposed on varying scale; industrial units exporting at least 20 per cent of production will be eligible for AU licence. Indian Nationals returning from residing abroad will be allowed import of machinery including research equipment, test and quality control equipments, raw materials and components for setting up industrial units in India upto Rs 25 lakhs c.i.f.

Fruit and vegetable preservation industry has made strides in developing export markets for processed tropical fruits and vegetables and their products. There has been a tangible growth in the development of exports. Given the desired incentive the industry can significantly improve upon its performance. The Association has put up a deserving case to the Government for allotment of levy sugar and relief from Central Excise. This needs to be considered with sympathy and understanding.

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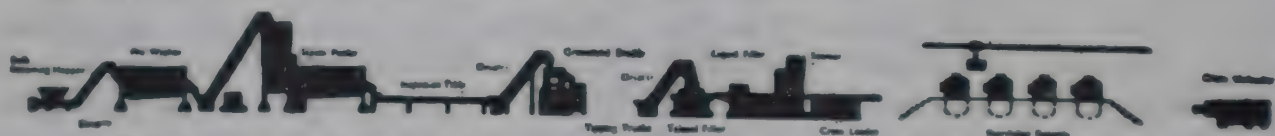
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CHANGES IN THE NUTRITIONAL VALUE OF THE AFD FOODSTUFFS DURING PROCESSING AND STORAGE

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Introduction

Conventional air drying, spray drying, foam-mat drying, vacuum puff drying and freeze drying are few of the many food dehydration methods employed for development of ready-to-eat and convenience foods. In spite of the great advances which have been made in recent times in these techniques, dehydrated foodstuffs still undergo chemical and physical changes associated with lowered nutritional values. The present communication will be restricted to a discussion on the potential advantages of the freeze drying technique in overall retention of the nutritional value of foodstuffs.

Cotson and Smith and Flosdorf in their books have given details about the technique of freeze drying^{1,2}. M. J. M. Vant Root³ has given the advantages of freeze drying over conventional drying. As in freeze drying, the drying temperature is low, the heat labile nutrients are retained, the solutes made immobile and fixed between the ice crystals; there is no liquid phase to cause shrinkage and the final product has very low moisture content (2 per cent) to cause contamination and certain chemical changes. In spite of all these, the high nutritional qualities are limited by many chemical deteriorative processes. These may occur during processing or storage and are influenced by temperature, moisture content, oxygen pressure etc. Few of such changes which might affect the nutritional quality of AFD foodstuffs

are changes in proteins and available amino acids, development of browning, liquid oxidation and loss of vitamins.

(i) *Proteins and available amino acids:* When protein rich foods are freeze dried, due to low processing temperatures, the proteins are not seriously damaged. The protein digestibility ratio (PDR) indexes of freeze dried beef and haddock showed no change due to dehydration, rehydration and reconstitution.⁴ In fact on storage at -29°C and 37.7°C in pouches and cans the beef samples which were dried to 2 per cent moisture content showed an increase in PDR, the index increasing from 77 to 81 and 80. The biological value, digestibility, and net protein utilisation (NPU) of freeze dried chicken, beef and haddock have been studied⁵. All the three parameters showed insignificant change due to freeze drying as compared to the fresh cooked ones. In 1963, de Groot⁶ studied the effect of the type of dehydration with respect to the above three parameters on some of the foodstuffs preserved by hot air drying, vacuum drying, spray drying and freeze drying. He observed that hot air drying showed indications of slight protein damage as compared to spray drying and freeze drying. Protein efficiency ratio (PER) and protein quality value were measured by Goldblith⁷ in freeze dried shrimp, crab meat and chicken. There was no difference in the PER value of the frozen and freeze dried shrimp,

crab and chicken. Freeze dried shrimp and crab showed higher protein quality value. Munday and O'grady's⁸ animal experiments with high protein diet showed little difference in the nutritive value of fresh and AFD foods. Slight reduction in nutritive value as a result of freezing and AFD processing occurred in protein deficient animals. This might be due to the dietary stress or the inadequacy of the processed foods for normal growth. Work done at the experimental factory in Aberdeen⁹ showed that the AFD products subjected to severe conditions of accelerated storage resulted in little change in the NPU. Animal feeding tests indicated the net protein utilisation to be high even after the foodstuff was decided inedible due to other deteriorative changes. Since it is reported that freeze drying does not modify the nutritive properties of proteins, E. Yanez *et al.*¹⁰ have taken freeze dried hake as the standard and compared the changes in the fish protein dried in air at 105°C and at 170°C. The damage was proportional to the temperature and length of heating. True digestibility decreased from 94.3 in freeze dried to 89.3 at 105°C and 74.2 in the samples dried at 170°C. A decrease was also observed in the biological and net protein utilisation values of hake dried at 170°C.

Accelerated freeze drying has been reported to impair protein solubility in egg powder^{6,11}. Dehydrated beef showed a decrease in solubility of all nitrogenous extracts¹¹. Denaturation was probably the cause for the decrease in solubility of the nitrogenous compounds of freeze dried raw beef during storage. Mackenzie and Luyet found that exposure of muscle tissue freeze dried at -10°C to 80°C for 24 hrs led to losses in extractability¹².

Apples dehydrated by three different dehydration techniques were analysed for

their neutral and acidic amino acids¹³. The hot air and microwave dried samples had an overall lower amino acid content than the freeze dried samples. As heat sensitive amino acids lysine and methionine with highly reactive functional groups can react rapidly at higher temperatures, it is expected that freeze drying would prevent such high temperature favoured reactions. The changes in essential amino acids were found much lower in the products of lyophilisation¹⁴ than in those dried by other methods.

Ford¹⁵ estimated the availability of amino acids in freeze dried cod fillets and found negligible changes in the total and available amino acids.

Liquid phase drying would undoubtedly lead to some binding of carbonyl groups to protein during the processing operation. Freeze drying should therefore have no effect on such a reaction. Tannenbaum¹⁶ could recover glucose quantitatively free of insulin from the freeze dried model system of insulin and radioactive glucose. On storage at 37°C and 75 per cent RH he found irreversible binding of 50 per cent of the glucose to the protein within a short period of four hours.

Since freeze drying caused negligible loss of amino acids and no modification of the protein quality there is little data on the consequences of the process of freeze drying on these parameters.

(ii) *Non-enzymatic browning and loss of ascorbic acid:*

Unfavourable changes occurring due to browning are loss of acceptable colour, development of off flavour and loss of solubility. Browning is caused by carbonyl and amino reactions. M. Karel¹⁷ has discussed about non-enzymatic browning and lipid oxidation as two of the unsolved problems in chemical stability of freeze dried foods. Oxidised phenolic compounds, products of lipid

oxidation, oxidised ascorbic acid and reducing sugars in the presence of catalysts contribute to the carbonyl compound pool, which in the presence of amino compounds gives rise to brown polymers associated with off flavour, colour, loss of solubility and biological value of proteins. The nutritional qualities of the foods may also be impaired especially in ascorbic acid concentration and available lysine since both of the above compounds are involved in the reaction.

Freeze dried, nitrogen packed turkey muscle with moisture contents of 0.8 per cent, 5.4 per cent and 8.2 per cent on a fat free solid basis, when stored at 37°C for 3 months, showed browning which was proportional to the moisture contents¹⁸. The samples with the high moisture contents showed darkening associated with burnt, bitter flavour typical of non-enzymatic browning whereas the meat with 0.8 per cent moisture lost its pink colour but developed no off flavour or brown colour. Similar meat stored in air at 37°C deteriorated to a pale yellow colour with a musty odour in three months.

Draudt and Huang¹⁹ studied the effect of moisture content on the carbonyl-amine browning of freeze dried peaches and bananas. The rate of browning increased at the higher moisture levels. They could detect the browning intermediates after 138 days of storage at 28°C in freeze dried peaches with moisture contents of 1.68 per cent and above but not in those with 0.55 per cent moisture. The browning intermediates detected by paper chromatographic techniques were fructose-asparagine, fructose-aspartic acid and a reaction product of ammonia and D glucose. Even though the sugars detected in this case are all reducing, browning was observed in model systems containing sucrose as the only carbohydrate. Subsequent investigations confirmed that the browning was due to the

hydrolysis of sucrose to the reducing sugars. The occurrence of enzymatic reaction in foods during drying and storage has been reviewed by Joslyn and Ackar^{20,21,21a}. Matheson studied the enzymic activity at low moisture levels with reference to the storage stability of raw and precooked freeze dried foods²².

Braverman²³ stated that browning in dehydrated fruits occurs only after bulk of the ascorbic acid has disappeared. Losses of up to 70 per cent ascorbic acid in 90 days storage at 40°C in the case of freeze dried strawberries, black currants and Roselips are reported²⁴. Much work has been done to correlate the loss of ascorbic acid to the extent of browning in fruits^{25, 26, 27}). Storage studies showed losses in ascorbic acid in peas^{9, 28}) strawberry juice and tomato paste⁸, etc., but orange pulp examined did not appear to have been impaired this way. During freeze drying also certain fresh fruits and berries lost 10-15 per cent of vitamin C²⁹. Among freeze dried fruits, some of them have a higher retention of ascorbic acid as compared with other fruits¹⁹. At 28°C storage temperature in 128 days bananas of 0.7 per cent moisture had 66 per cent retention whereas under similar conditions and 0.72 per cent moisture Georgia cling peaches retained 97.6 per cent of ascorbic acid. The loss of ascorbic acid content during storage of guava powder was relatively lower than that of orange powder³⁰. According to Karel and Nikerson³¹ there seems to be no critical value of water activity below which there is no destruction of ascorbic acid. The use of evacuated or inert gas packing is not necessary since oxygen has got little effect on the destruction of ascorbic acid.

(iii) Lipid oxidation:

The oxidation of lipid and other oxidation susceptible food components is one

of the major problems in retention of quality in freeze dried foods. Karel³² found that the surface area exposed to the oxygen is an important variable in this case and freeze dried foods because of the very large internal surface areas and very low moisture contents are easily susceptible to lipid oxidation. The primary lipid contributing to oxidative deterioration is linoleic acid^{33, 34}. Fatty acid composition of free and bound lipids in freeze dried meat has been given³⁵. Autoxidation of freeze dried meat takes place in two stages^{36, 37} first the protein bound lipids autoxidise and after a period of lower oxygen absorption the free fat begins to autoxidise. It is found that phospholipids¹¹ are more susceptible to oxidation than neutral fats. But the reason is not very clear. Hydrolysis of lipids upto 20-30 days storage at 37°C has been observed¹⁸. The highest level of free fatty acids reached was approximately 16 to 22 per cent of the total fatty acids present. According to Fishwick and Zmarlicki metmyoglobin catalyses autoxidation of unsaturated lipids in the rehydrated muscle, when it is rehydrated to a water content not less than 50 per cent of that of fresh muscle. Tappel in a series of papers on freeze dried meat has described the mechanism of non-oxidative deterioration, and the factors affecting the rate of deterioration of freeze dried meat^{38, 39}. Aitken found that surface temperatures below 60°C during freeze drying did not alter the appearance or organoleptic properties of pork⁴⁰. The work of Tuany J. M. and Felder J. confirmed the same⁴¹.

The classical method of preventing oxidative deterioration have been by (a) incorporation of antioxidants, and (b) minimising oxygen pressure. Various oxygen scavengers for inclusion with freeze dried foods (palladium catalyst systems) in the package have been suggested⁴². Amino

acids have been used as antioxidants in autoxidation of methyl linoleate in freeze dried model systems⁴³. Most of the amino acids showed antioxidant activity as great as or greater than the effects reported and some showed equal with that of propyl gallate. Methionine, phenylalanine, isoleucine and arginine did not show any effect.

(iv) Loss of vitamins:

Few of the vegetables and fruits are rich sources of β -carotene (pro vitamin A) when these are dehydrated or canned; discolouration occurs during storage due to the oxidation of β -carotene to β -ionone etc. Higher percentage of retention has been found in the case of freeze dried vegetables and fruits^{39, 40}. The loss of β -carotene in carrots as a result of various types of dehydration procedures gave only a slightly greater retention with the freeze dehydrated process⁴⁴. Vacuum puff dried product was superior to its conventionally dried counterpart. Cooked freeze dried products retained somewhat higher levels of the vitamins. But Lempker's experiments⁴⁵ with freeze dried boiled carrots showed that carotenes present in lyophilised carrots to be highly unstable. Tomkins *et al.* stated that a slight off flavour could be detected only when 20 per cent of the carotene had been lost. But later it was found that off flavour occurred even when less than 5 per cent loss had occurred⁴⁶. In AFD carrot, loss of carotene by oxidation is closely related with development of off flavour. According to Dorothy⁴⁷ and Hollingsworth⁴⁸, if colour and flavour are retained β -carotene is also retained.

Microbiological assay of AFD foods for the vitamins have shown⁸ a loss of about 7 per cent of the riboflavin and 30 per cent of the nicotinic acid after 18 months storage at 37°C; pantothenic

acid and vitamin B₁₂ are stable. Percentages of retention of these vitamins were different in the cases of pork, silver-side and mutton. The removal of water definitely increased the retention of thiamine^{48,49}. Irradiation over a range of 0 to 4.5 megarads gave no significant destruction of thiamine. The freeze dehydration process destroyed about one-third of the initial thiamine content in the case of pork⁵⁰.

Thomas and Calloway⁵¹ estimated the thiamine, riboflavin and pyridoxine content of shrimp and chicken which were preserved by the three different methods (frozen, freeze dried and canned). All the three vitamins are almost unaffected by lyophilisation in the case of chicken muscle. Cooked dehydrated tissue lost the same amount of thiamine as a fresh cooked sample.

In the case of curd dried at a surface temperature of 50°C, we found the thiamine loss to be only 10-15 mcgs during processing. Studies on the evaluation of nutritional value of some accelerated freeze dried foodstuffs conducted at Defence Research Laboratory, Kanpur, showed considerable retention of vitamin C, thiamine, and niacine. Riboflavin does not deteriorate even after accelerated freeze dried processing. Retention of thiamine in the case of carrot was considerably less.

Conclusion

It is seen that the quality of the fresh food is kept close to the original in freeze drying preservation of foods. Due to the low temperature maintained during drying none of the heat labile nutrients are affected considerably. The very low moisture content of the final product obtained by this method prevents deteriorative changes taking place due to the presence of water. But in the case of

freeze dried food materials with high fat content, it has been reported to accelerated lipid oxidation, particularly when the oxygen concentration exceeds certain limit. Use of antioxidants may retard them to a certain extent but not sufficient enough to keep the product acceptable for a long time. There is need to undertake detailed studies on the mechanism of storage deterioration of freeze dried products like meat, poultry, fish, eggs, fruit and vegetables, so that measures to prevent these undesirable changes can be adopted. In the case of fruit juice powders processed with added sugar to raise the brix, in spite of their low moisture contents caking is observed even on storage at 37°C within 6 months which makes the product difficult to reconstitute. Studies in this field to maintain the free flowing quality of the powder is necessary.

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MICROBIAL CONTAMINATION IN SPICES

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Summary

During the course of the work on the development of some dehydrated curried convenience foods like pulav, khichri and ready-to-eat compressed food formulations, it was of interest to study the microbial load contributed by spices. Out of the thirteen individual spices and four spice mixtures examined from various sources the heaviest contamination was found in coriander, chilli and turmeric. The presence of a large number of thermophiles and spore formers was significant. *Staphylococci* were present, but none were coagulase positive. *Clostridium perfringens* was present in four cases only. *Salmonella* was found to be absent in all the samples examined.

Introduction

Spices find extensive use in foods for their pungency and flavour. In view of the primitive methods of post-harvest handling and processing, spices get heavily contaminated with microorganisms. Contaminated spices contribute undesirable kinds of microorganisms to foods in which they are used and may bring about their premature spoilage. In the preparation of ready-to-serve or instant type of convenience food formulations, they present more serious problems as the food is consumed as such or wherever there is reconstitution it is too inadequate to bring about any appreciable change in the microbial load. Information regarding the levels of microbial contamination in spices, types of flora and development of efficient methods of controlling the load to acceptable and safe limits is urgently required. Hence a survey of several varieties of spices and spice mixtures of the local market was undertaken.

Materials and Methods

The individual spices were bought in 1 kg quantities from 5 different sources.

The four spice mixtures of mutton *masala*, chicken *masala*, egg curry *masala* and fish curry *masala* were trade samples and were bought as 100 g packets. Samples were analysed for total plate count, thermophiles, aerobic spore formers, yeasts, moulds and staphylococci as per standard methods.¹ Coliforms were estimated on violet red bile agar. *Clostridium perfringens* was enumerated as per the procedure of Thatcher and Clark². Examination for *Salmonella* was done according to the method of Harrigan and McCance³ using selenite broth as the enrichment medium. Streaking was done on s.s. agar and colourless colonies after 24 and 48 hours were isolated and tested for different biochemical reactions on Kohn's 2-tube media and triple sugar iron agar. Average results of three analyses are shown in Table 1.

Results and Discussion

Salmonella was not present in any of the spices or spice mixtures examined and these negative results are not shown in the table. Similarly, *Clostridium perfringens* was present only in the following

Table 1. Continued in adjacent page (Table 2)

Item	Notes	Number of specimens	Test results	Test and analysis	Remarks	Comments	Ref.
1. Red loam	a	10	10	10	10	10	
2. Blue loam	a	10	10	10	10	10	
3. Clay powder	a	10	10	10	10	10	
4. Cement	a	10	10	10	10	10	
5. Cement	a	10	10	10	10	10	
6. Cement powder	a	10	10	10	10	10	
7. Cement	a	10	10	10	10	10	
8. Cement	a	10	10	10	10	10	
9. Cement	a	10	10	10	10	10	
10. Cement	a	10	10	10	10	10	
11. Cement	a	10	10	10	10	10	
12. Cement	a	10	10	10	10	10	
13. Cement powder	a	10	10	10	10	10	
14. Cement powder	a	10	10	10	10	10	
15. Cement powder	a	10	10	10	10	10	
16. Cement powder	a	10	10	10	10	10	
17. Cement powder	a	10	10	10	10	10	

Not done

samples and their number was very small; chilli powder and coriander powder from sources A, B and C (30/g), mustard from source C (30/g), fish curry masala (20/g) and mutton masala (160/g). A perusal of Table 1 shows that there is too much variation in the total number and types of microorganisms present in spices. Even for the individual spices, the load appears to differ from source to source. Highest standard plate counts were seen in chilli powder, turmeric powder, coriander powder and pepper. Thermophiles were significantly present in all and were fairly high in many samples, the highest being in turmeric (5.05 millions/g). Coliforms were present in some and were high in samples of chilli powder, coriander powder, ginger and pepper. Goliez⁴ studying spices frequently used in meat industry, however, found the highest concentration of coliforms in marjoram, pepper, paprika, cardamom and caraway. Yeasts and moulds were absent in cloves and cinnamon and were highest in ginger (of the order of 5×10^4). Staphylococci load varied from nil to a few thousands, but none were coagulase positive. Contamination from aerobic spore formers was highest in turmeric (73×10^2). The lowest microbial contamination is in cinnamon and cloves. It is significant here that ground cinnamon and cloves are known to exhibit inhibitory action on bacteria in low concentrations. As in the case of individual spices, mixtures of spices also showed wide variations in the microbial contamination.

The extreme variations in the method of harvesting by hand, drying in the open and the general cleanliness in the surroundings could be the reason for these variations from source to source. Spice contamination has been reported earlier also^{1,2,7}. More recently, Krishnaswamy *et al.*⁸ have enumerated the microorganisms present in eight spices and three spice mixtures. However, as Vaughn⁹ has

observed, no single group of bacteria could serve as an index of microbial standard. The important groups will depend upon the type of food in which it is used. If they are to be used in canned products the heat resistant thermophiles and spore formers should be low; if used in frozen foods, psychrophiles or psychrotrophic microorganisms will be important; in dehydrated convenience foods standard plate count and coliform counts will have to be low to ensure that the food is prepared under hygienic conditions from good quality ingredients.

These extremely high and wide variations of contamination in spices call for more standardised methods of harvesting, drying, milling etc. It is also necessary to give some pretreatment and also specify microbial limits.

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A REVIEW ON MICROBIOLOGICAL ASPECTS OF DRESSED CHICKEN

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Research in the area of poultry science has brought out certain improvements in breeding, nutrition, disease control, management, processing, packing and distribution. Parallel with these advancements the demand for various processed poultry products have also increased at a steady rate. Today, the non-vegetarian consumers in addition to eviscerated cut up and tray packed chicken are looking ahead for various convenience items such as poultry roll, streaks, roasts etc. While attempting to produce these items to satisfy the requirements of the consumers, the products are bound to undergo certain amount of handling and processing. The more the product undergoes handling and processing the greater are the chances for it to get contaminated with pathogens and spoilage organisms. Moreover, once a perishable product like chicken is loaded with excessive organisms it becomes undesirable not only from the point of view of public health but also from storage and aesthetic principles. Keeping this in view the present review has been written with an aim to pin point the various sources of contamination of dressed chicken, determine the composition of microflora present on it and their significance in relation to human health and how best they can be avoided while processing and distribution.

(i) Sources of contamination:

The sources of contamination of dressed chicken can be many. At times, the bird itself becomes a potential source of

contamination. Diseased and carrier birds can act as a source of contamination for other healthy birds during the process of handling and dressing. It has been shown by Ayres *et al.*¹ and Drewinak *et al.*² that many a times the organisms present on the skin of the live bird may gain entry into the finished product. These are derived mostly from the feet, feathers and faeces of the host. It has been estimated by Walker and Ayres³ that the total count on the skin of the live chicken may be as high as 1500 organisms per sq. cm. Sometimes, soil, water used for cleaning the birds and their intestinal contents may also act as positive contributors to the microbial load of dressed chicken (Walker and Ayres³). The environment of the processing plant, cutting tools used for dressing poultry, plant personnel and water used for processing have also been observed to act as important sources of microbial contamination (Ayres^{4,5}). With this background in mind it is not difficult to foresee why highly processed products are heavily contaminated. In addition, the role of dressing and eviscerating lines of a processing plant in disseminating microorganisms have been amply stressed by many including Drewinak *et al.*², Gunderson *et al.*⁶, Walker and Ayres⁴, Barnes^{7,8}, May⁹, Kotula *et al.*¹⁰ and Surkiewicz *et al.*¹¹. Kraft¹², while quoting DaSilva, stated that the type of picking equipment used in a processing plant is responsible to a great extent in determining the contamination load of

the finished product, especially with respect to *Salmonella* and *Staphylococcus*. Spiral automatic pickers have been blamed to spread such contamination during processing to a greater extent than the defeathering equipments. He also indicated that much of the *Staphylococcal* contamination was from the hands of the factory workers requiring attention for better personnel hygiene of the factory workers.

(ii) *Microflora of dressed chicken:*

Several reports have been published about the association of various types of micro organisms on dressed chicken both at the processor as well as retailer's level. The details of such isolations made by Gunderson *et al.*^{6,13}, Ayres *et al.*¹, Salzer *et al.*^{1,4} and Panda¹⁵ have been listed in Table 1.

TABLE 1. *Microflora of dressed poultry*

Sl. No.	Genus	Investigators			
		Gunderson <i>et al.</i> ¹³	Ayres <i>et al.</i> ¹	Salzer <i>et al.</i> ¹⁴	Panda ¹⁵
1.	<i>Achromobacter</i>	+	+	+	+
2.	<i>Actinomycosis</i>	+	—	—	—
3.	<i>Aerobacter</i>	+	+	+	+
4.	<i>Alcaligenes</i>	+	+	+	—
5.	<i>Arthrobacter</i>	—	—	+	—
6.	<i>Bacillus</i>	+	+	+	+
7.	<i>Brevibacterium</i>	—	—	+	—
8.	<i>Corynebacterium</i>	+	+	+	—
9.	<i>Escherichia</i>	+	+	+	+
10.	<i>Flavobacteria</i>	+	+	—	+
11.	<i>Gaffkya</i>	+	—	—	—
12.	<i>Haemophilus</i>	+	—	—	—
13.	<i>Lactobacillus</i>	—	—	+	+
14.	<i>Micrococcus</i>	+	+	+	+
15.	<i>Neisseria</i>	+	—	—	—
16.	<i>Paracolobacterium</i>	+	+	—	—
17.	<i>Proteus</i>	+	+	+	—
18.	<i>Salmonella</i>	+	+	+	+
19.	<i>Sarcina</i>	+	+	+	—
20.	<i>Staphylococcus</i>	+	+	+	+
21.	<i>Streptococcus</i>	—	+	+	+
22.	<i>Pseudomonas</i>	+	+	+	+
23.	<i>Microbacterium</i>	+	+	—	—
24.	<i>Streptomyces</i>	+	+	—	—

+ isolated

— not isolated

A glance at the said table reveals that organisms belonging to 24 different genera can be commonly seen on dressed chicken. The significance of these isolates in relation to public health are well known to one and all. Some of these organisms are pathogenic and the rest are not. Among the pathogenic ones the importance of *Salmonella* and *Staphylococcal* organisms has been emphasized from time to time. Edwards¹⁶ considered poultry as one of the largest single reservoirs of *Salmonella* infection in United States and after 15 years the truth of the statement was realised following reports made by Edward *et al.*¹⁷, who showed that almost half of the cultures isolated from food infection were of chicken origin. Same year, Hinshaw and McNeil¹⁸ stated that 56 to 60 serotypes of *Salmonella* isolated from birds were responsible for causing illness in human beings. Today according to a recent report published by Panda¹⁹ this has further enlarged to more than hundred serotypes. Involvement of poultry processing plants in transmitting *Salmonellosis* has been shown by several workers including Gunderson *et al.*⁶, Galton *et al.*²⁰, Bobst *et al.*²¹, Morris and Ayres²², Wilson *et al.*²³, Wilder and Mac-Cready²⁴ and Woodburn and Stadelman²⁵. The above workers have reported that the incidence of *Salmonella* in different poultry processing plants is between 5.5 to 17 per cent. Besides chicken samples obtained from retail stores situated in Ohio (Wilson *et al.*²³), Indiana (Woodburn²⁵) and other parts of USA (May²⁶) have also shown to contain *Salmonella* infection. According to a recent report²⁷ published from U.S. Department of Health, *Salmonella* were responsible for 12.5 per cent of food borne outbreaks recorded in 1968 and 13 per cent in 1969. The said report also indicated that out of the total number of outbreaks recorded in 1969, 4.5 per cent of the outbreaks

were due to domestication and to the fact that in developing countries agriculture which is less important than industry and services. The situation with respect to incidence of salmonella through poultry and poultry products is no better in other countries. Reports published from different parts of the World indicating chicken and poultry products as a source of salmonella contamination have been shown in Table 2. These findings confirm the fact that salmonella through poultry and poultry products is still a major threat to public health in several parts of the Globe and some careful attention is being given to this subject.

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2.1. Method, sample and design

Members should be in a position to producing the desired political results. Let it not be said that the members have been disappointed. Conditions have shown that the best means to really bring about a change in the political party is to have the members. We are not sure that the members are the only ones who can be counted on to bring about a change in the political party. We are not sure that the members are the only ones who can be counted on to bring about a change in the political party. We are not sure that the members are the only ones who can be counted on to bring about a change in the political party.

Figure 2.2. Distribution of *Neobornia* from 1960 to 1980. The number of specimens collected in each year is shown in parentheses.

No.	Name of the country	Notes	References
1. America	North America		
2. Europe	Western Europe		
3. Canada	Canada		
4. Asia	Eastern Asia		
5. Africa	North Africa		
6. Australia	Australia		
7. U.S.A.	United States of America		
8. U.K.	United Kingdom		

Panda¹⁶ indicated that the microbial number of warm eviscerated chicken sold in the retailing centres of the country was found to range between 2.5×10^5 to 5.4×10^6 per sq. cm. May²² evaluated the total count of chicken purchased from retailing outlets to lie in the range of 10^2 to 16.2×10^7 per sq. cm.

It has been shown that with the rise in the total microbial number the shelf-life of the dressed bird decreases. According to May *et al.*²² spoilage changes could be noticed in the carcasses when the total count approached 10^6 per gm of tissue. Panda²³, Essary *et al.*²⁰ and Ayres *et al.*¹ have shown that development of off odour in dressed birds become prominent when the microbial count reaches 10^7 or 10^8 per sq. cm. Ayres *et al.*¹ mentioned that the formation on skin surface of birds occurred when the total microbial load exceeded 10^6 per sq. cm.

High microbial count can be linked to unhygienic processing, faulty handling and time temperature abuse. Hence, it is advisable to keep the bacterial count as low as possible in the finished product. The advantages of following the above principle are mainly threefold: i. control of health hazards, ii. maintenance of natural flavour and iii. improvement in the shelf-life of the product.

c) Processing technique and bacterial number:

To obtain a good market poultry the bacterial population on the product should be as low as possible during processing. To achieve the same, careful attention should be paid to every step of processing. It has already been pointed out that dressing and eviscerating lines of a processing plant act as some of the main avenues of bacterial dissemination.

Thompson and Kotula²¹ observed that sometimes air sac contamination occurs due

to different methods adopted in killing and scalding which in turn pose problems of bacterial control during processing. The two common methods of killing such as outside cut (trachea intact) and kosher cut (trachea severed) have their advantages as well as disadvantages. When the former method is employed the bird may gasp water during scalding and thereby draw large number of organisms present in the scalding tank to the air sac contaminating the ultimate product. However, the above risk is minimized in the latter method. Perfect bleeding at the end of killing has also been observed to influence the bacteriological condition of the dressed chicken. Panda²³ showed that the keeping quality of the dressed birds was better when the bleeding was perfect and the amount of blood recovered per bird was more than 3.5 per cent.

Scalding is another step in processing where microbial contamination can occur easily. Tarver and May²² stated that though the microbial count of the scalding tank is negligible in the beginning it may show an increase at the end of each scalding. Walker and Ayres³ pointed out that the microbial count of scald water tank from chicken processing plants varied between 5,900 to 17,000 organisms per milliliter, with a mean value of 2200 per milliliter. However, the count reported by Nagel *et al.*²⁴ was comparatively low (400 to 2,500 ml). The variation in the said figures can be explained as due to (i) variation in the scalding tank temperature (52° to 60°C), (ii) initial low counts in the live birds of certain batches and (iii) dilution effect of the fresh addition of scald water. Recent studies carried out by Sahai²⁵ in this direction has shown that the use of a sanitizing agent in the scalding tank is quite beneficial in curtailing the microbial load in the finished product.

Walker and Ayres³ observed that there occurs a progressive increase of 20 folds

in the National Institute during 1960-61. Karl and Thomas¹⁰ and Thomas¹¹ noted that the National Institute experimental system could be effectively reduced by using a greater volume of water with slightly varying action of the rubber flaps in the water. Thomas¹¹ of course, being conservative, has been slow to accept the full-size for 1-2 days or even is reluctant to accept any in theory and theory¹². Later, it was mentioned that volume of concentration for aluminum ions were not very varying with time and composition. High water was available at the time and water was immediately for water for water and time. Later it was mentioned if you had a greater volume of water than time, water being which water does in only 1 per cent at the end of 1.

While discussing the effect of calling on capitalist markets Kautsky at all times has the national issue in the foreground. He is especially anxious to bring out the importance of the national issue in connection with the national strike. On the other hand when a national strike has without external aid been for the purpose of doing justice to some wrong or with a goal of a kind. Kautsky at all times believed against the view of doing a national strike without the national issue in the idea which is covered under "Peace" and "Justice" made a complete break in fact with the effect of the strike and every strike in the international field. They showed that though the strike is better in making the international as a goal even if the strike is of one international the product is important to open calling. Kautsky pointed out the special influence of Germany and showed following that several other things in a considerable extent that at the end of international and that working in a strike movement.

Thermogravimetric analysis (TGA) was used to determine the thermal stability of the polyimides. The results are shown in Figure 1. The polyimides showed excellent thermal stability, with weight loss beginning at approximately 300°C and reaching 10% weight loss at temperatures between 400°C and 500°C. The polyimides were stable up to 500°C in air and 550°C in nitrogen, indicating good thermal stability.

Based on the comments, we have concluded that public relations which are conducted without the understanding and backing of leading labor groups is regarded as a waste of time and money. It is also felt that the material in the proceedings will not have bearing on the industry labor relations should be the Government and public body.

ld try to enforce it after it is being led. However, the unity and better efforts of such a practice should be

made clear to the producers and consumers who ultimately form the important part of the marketing channel.

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QUALITY CHARACTERISTICS OF SOME INDIAN MUSTARDS

VIJAY SETHI AND J. C. ANAND

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Mustard, beside an oil source, is an important condiment and used in various food products. Whole mustard is used as a flavouring component in Indian pickles and curried preparations. Mustard flour and variety of its compounds have been used to add piquancy to different foods. Its medicinal value has also been recognised.

It is available in the market under different names and there exists a great confusion about its nomenclature. The principal oleiferous *Brassicas* in India are generally divided into three groups viz. (1) Rai or Indian mustard (*Brassica juncea*), (2) Sarson (*Brassica campestris* var. *dichotoma* and var. *sarson*) and (3) Toria (*Brassica campestris* var. *toria*). There is another oil seed crop *Taramira* (*Eruca sativa*) belonging to the same family *Cruciferae*. In trade, the terms rape and mustard are invariably used to cover *rai*, *sarson*, *toria* and *taramira*. While the mustard refers particularly to *rai*, rape is used both for *sarson* and *toria*. Further mustard is subdivided into species like Black mustard (*B. nigra*), White mustard (*Sinapis alba*), Punjab rai (*B. tournefortii*) and Phari rai (*B. juncea* var. *rugosa*) etc.

While testing the suitability of different types of rape and mustard seeds in pickle making it was considered desirable to analyse and find out the distinctive features among these oil seeds. The physico-chemical analysis of some of the specimen examined formed the subject matter of the present study.

Material and Methods

(i) *Rape and mustard seeds*: Important types of rape and mustard seeds invariably used in pickles were purchased from the market under popular trade names. Besides a few strains of mustard were also obtained from the laboratory of All India Coordinate Research Project on Oil Seeds in the Division of Genetics at Indian Agricultural Research Institute, New Delhi.

(ii) *Physico-chemical analysis of seedse* Visual assessment of the colour, shape and other characteristics of the seeds was made carefully. Chemical analysis of mustard and rape seeds was carried out according to the methods given in A.O.A.C. (1960). Volatile oil in the seeds was determined by the method given in the book on the Analysis of Foods by Winton (1945).

Results and Discussion

From the physical characteristics listed in Table 1 for rape and mustard seeds it is not possible to visually distinguish between the different types. On the basis of colour it is possible to identify only *Yellow sarson* and *White sarson* due to their distinctive colour. The colour in others varied between reddish brown and dark brown hue and most of them were thus indistinguishable.

Size of the seed could help to identify *Banarsi rai* and *Yellow sarson* on account of their having the smallest and the largest seeds respectively among different varieties used in the present study. *Yellow sarson*

Table 1. Nomenclature and physical characteristics of Indian oil crops Brassica

Sl. No.	Common name	Species	Distribution in India	Seed Characteristics	Av. No. of seeds/g	Total oil in seeds (%)	Volatile oil in seeds (%)	Uses
1	Yellow sarson or Indian Cuscuta or Farsan	<i>Brassica campestris</i> Linn. var. <i>Sarson</i> Puri	U.P., Punjab, Bihar, Bengal, Assam	Seeds flattened, light yellow or yellow, smooth seed coat, non-mucilaginous, very pungent	170	25-43	(0.25-0.70)	Oil is used for cooking and heating purposes and oil cakes for cattle feed. Young leaves used as vegetable.
2	Brown sarson or Falsi sarson or Farnal and Fata	<i>Brassica campestris</i> Linn. var. <i>chola</i> Linn. var. <i>Wari</i>	U.P., Punjab, Haryana, Bengal, Assam	Seeds roundish, yellowish brown or blackish brown, finely wrinkled, mucilaginous	366	35-43	0.33	Oil is used for cooking purposes and for medicinal purposes. Young leaves and stems used as vegetable, leaves as cattle feed.
3	Turai or Indian rape	<i>B. campestris</i> Linn. var. <i>Toria</i> Dubie and Fuller	U.P., Punjab, West Bengal, Assam, Bihar	Seeds roundish, reddish brown, smaller than yellow sarson, finely rugose surface, non-mucilaginous, slightly pungent	235	30-46	0.14 or (0.21-0.64%)	Oil is used for edible purposes and seed is used for cattle and table sowing. Oil is used for industrial purposes and oil cake as manure and cattle feed.
4	Indian mustard or rai, rabi, Rapa	<i>B. juncea</i> Cass	U.P., Punjab, Haryana, West Bengal, Bihar, Assam	Seeds roundish, reddish brown or dark brown, finely rugose seed coat, non-mucilaginous, highly pungent	211 (245-45%)	30-42	0.45 or (0.57-1.95%)	Seeds are used for mustard flour and mustard oil. It also has oil cake used as a space and as a substitute for black mustard. Oil is used for cooking and as bath oil. Better oil than turai and sarson, but less pungent. Cabbage is used as cattle feed.

Sl. No.	Common name	Species	Distribution in India	Seed Characteristics	Av. No. of Seeds/g	Total oil in seeds (%)	Volatile oil in seeds (%)	Uses
5.	<i>Banarsi rai</i> , true mustard or black mustard (kali rai) or Chhota rai	<i>B. nigra</i> Koch	U.P., Punjab, Tamil Nadu, Mysore	Seeds roundish, dark brown, finely rugose surface, mucilaginous, highly pungent	685 (1000-1400)	33	0.68 (0.7-1.2)	Seeds are used as table mustard and also as a spice and for mustard hour and mustard compound with white mustard and <i>rai</i> . It is also used for pickle and curries. Oil is used as a liniment and as bread oil. It is known as pickle <i>rai</i> .
6.	White mustard or <i>Safed rai</i>	<i>Sinapis alba</i> (Sign. <i>B. alba</i> Boiss)	Upper India, U.P., Punjab, Rajasthan	Seeds large, white, lightly pitted, mucilaginous	N.A.	27-36	(0.16-0.23)	Seeds are used in mustard compound alongwith <i>B. nigra</i> and <i>B. juncea</i> . Young leaves and tender shoots are eaten as vegetable. Fatty oil from seeds is used for industrial purposes
7.	<i>Punjab rai</i>	<i>B. tournefortii</i> Gouan	Central Districts of Punjab, H. P. (on Hilly areas)	N.A.	N.A.	30-31	N.A.	It does not contribute to the commercial oil seed crop of India
8.	<i>Taramira</i> or Rocket-Saled or Taramim, Duan	<i>Eruca sativa</i> Lam	U.P. (Western), Highlands of Punjab, Har yana	Seeds ovoid shape, light reddish brown, smooth surface, mucilaginous, coating irregular, highly pungent	472 (250-600)	30-35	(0.43-1.00)	Oil is mainly used for luminous and less sooty flame. It yields Jamba oil which is mainly used for burning purposes. It is used as sealed oil in Southern Europe. Plant is used as a fodder. In Punjab oil is used for pickle. Oilcake used in cattle feed in U.P. and Punjab

N. A. = Not Available.

could be further identified from its flattened seed and smooth seed coat as against ovoid shaped seeds in *Taramira*. All other seeds are roundish irrespective of their colour, size and nature of the seed coat.

Except one variety *viz.* *Toria* or *Indian rape* which tasted mildly pungent, all other varieties were found pungent or highly pungent. When soaked in small quantity of water all these varieties formed mucilage except *Yellow sarson*, *Toria* and *Indian mustard* (Table 1).

Further a great deal of variation was observed in the chemical composition of *Brassica* oil seeds (Table 2). The total fat (ether extract) in the varieties analysed ranged between 28.2 to 37.6 per cent, *Yellow sarson* having the highest while *Toria* having the lowest fat content. The volatile oil (allyl isothiocyanate) in rape and mustard seeds likewise varied consi-

derably, the highest being found in *Taramira* variety (Table 2). *White mustard* contained the least amount of volatile oil.

The composition of important varieties of *rai* (*B. juncea*) and three of the newly released strains (T-11, T-16 and *Varuna*) in Table 3 shows that although *Varuna* has the highest fat content it had the lowest volatile oil content. Generally speaking *rai* (*Brassica juncea*) could be ranked alongwith *Yellow sarson* (*B. campestris* var. *sarson*) and *White mustard* (*Sinapis alba*) as having the high oil bearing seeds.

As seen from these data it is very difficult to distinguish between *Indian rape* and *mustard seeds* on the basis of their physico-chemical properties. At present *Banarsi rai* (*B. nigra*), which can be easily distinguished by its small seeds, is invariably preferred by pickle industry for making sweet cauliflower and turnip pickle in

TABLE 2. Composition of *Brassica* Oil seeds

Sl. No.	Variety	Common name	Moisture (%)	Protein (N x 6.25) (%)	Ether extract or fat (%)	Total Ash (%)	Volatile oil (%)	Starch (by acid hydrolysis) (%)	Crude fibre (%)
1.	<i>Brassica juncea</i> T-6342	Rai	6.86	30.14	37.60	4.27	0.59	10.60	0.25
2.	<i>B. campestris</i> var. <i>toria</i> T-22	Indian rape or toria	6.89	30.14	28.20	4.38	0.44	10.80	0.85
3.	<i>B. campestris</i> var. <i>dichotoma</i> T-119	Brown sarson	6.48	25.87	30.50	4.02	0.61	10.40	0.60
4.	<i>B. campestris</i> var. <i>sarson</i> T-42	Yellow sarson	5.97	24.74	36.50	3.96	0.41	8.03	0.15
5.	<i>B. nigra</i>	Banarsi rai	2.64	28.43	28.50	4.50	0.59	15.02	3.80
6.	<i>Eruca sativa</i>	Taramira	2.24	29.53	31.55	4.19	0.79	16.39	3.48
7.	<i>Sinapis alba</i> *	White mustard	7.15	26.93	36.04	4.39	0.23	10.01	3.54

* G. L. Tandon and G. S. Siddappa, *Indian oil seed J.*, 7 (1), 55, (1963)

TABLE 3. *Composition of newly evolved strains of B. juncea**

Sl. No.	Chemical composition (%)	18-1431	T-11	R IV-7-3	T-16	R ₁ -7-4	Varuna	5422-2	5909	T-6342
1.	Moisture	2.76	2.54	3.74	2.18	2.86	2.64	2.58	2.14	6.86
2.	Protein (N × 6.25)	19.95	23.27	21.61	19.95	22.44	21.61	24.10	22.44	30.14
3.	Total oil	35.86	34.98	36.92	37.18	35.52	39.18	34.18	36.40	37.60
4.	Volatile oil	0.396	0.237	0.178	0.158	0.297	0.079	0.524	0.138	0.594
5.	Starch (by acid hydrolysis)	13.37	12.85	11.84	11.96	11.36	11.08	10.22	9.74	10.60
6.	Crude fibre	2.25	3.51	1.25	3.90	5.30	4.46	4.15	4.02	0.25
7.	Ash	4.06	4.45	4.02	4.04	4.32	3.63	4.27	4.08	4.27
8.	Ash insoluble in HCl	0.63	0.58	0.32	0.29	1.09	0.32	0.72	0.73	0.40

* Samples obtained from the Division of Genetics, I.A.R.I., New Delhi

Delhi. The reason for its particular preference for this purpose is not clear and needs to be further explored.

Acknowledgement

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INDIAN STANDARD SPECIFICATIONS FOR FISH AND FISH PRODUCTS

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With a view to exercise proper quality control over the raw material and processed fish products, the following tentative standards by Indian Standards Institution have been recommended.

Fresh fish. Strict sanitary code in respect of layout, plant and personnel is required to ensure good quality of the raw material and the processed fish products.^{1,2} Water used in processing shall be of potable quality and shall contain 1-10 ppm available chlorine. Greater emphasis is laid on the retention of characteristic flavour, taste, appearance and colour of fish. The fish are required to be graded according to size, properly iced and stored at temperature not exceeding 5°C (41°F)³⁻⁵.

Frozen fish. The raw material for freezing shall be fresh, clean, wholesome and show no signs of spoilage. The fish shall be properly iced and stored at 5°C or lower until delivery to the freezing factory. Freezing temperature shall not be higher than -30°C (-22°F). The time taken for freezing the material 2.5 cm thick shall not exceed 3 hours. The quick frozen product shall be uniformly glazed with water, packed in suitable containers and immediately transferred to the cold storage, the temperature of which shall not exceed -18°C. The drained weight of the containers shall be the same as declared and the count/kg of the material after thawing shall be the same as declared. Deterioration such as dehydration, oxidative rancidity and adverse changes in texture

shall not be present.^{6-10a} Microbiologic requirements per g. of Frozen Prawn grade I are: total plate count at max. 100,000, E. coli, faecal type salmonella, faecal streptococci, coagulase + tive staphylococci, and other pathogenic bacteria shall be absent.

Canned fish. It is required that the fish used is wholesome, fresh and properly cleaned. Entrails, scales, peels etc. shall be removed. Fish canned in oil shall not have more than 10 per cent free water in oil^{11, 12}. The oil used shall be of edible quality, deodorized, clear and light in colour^{11, 12}. The product shall not have broken pieces more than 5 per cent by weight. While canning Tuna, red meat has to be separated from white meat. Red meat if canned has to be declared as dark meat on the label. Tuna of the varieties—yellow fin, blue fin, big eye tuna, Northern blue fin, Oceanic skipjack are to be used¹³.

Sardines canned in brine, and in the juice will have max. content of NaCl in brine as 3.5 per cent and acidity of brine shall not exceed 0.2 per cent as citric acid.

Maximum limits of metallic impurities in canned products are arsenic 1, copper 20, lead 5, zinc 50 and tin 250 ppm.

Shrimp canned in brine shall be grade I or size from number of 5 counts to count 100. Minimum grade of count of 100 or above per 100 g. At least 90 per cent of the pieces in any sample shall have the declared size grade. Limits of acidity of brine as citric

acid shall be in the range of 0.06 to 0.2 per cent by weight.

Processing shall be at such temperature and for such length of time as will ensure adequate sterilization of the finished product without overcooking. Lacquered cans shall be used. Head space shall not be greater than 10 mm and vacuum shall not be less than 100 mm. Drained weight in case of Tuna canned in oil shall be 70 per cent of the net weight contents while in case of shrimp in brine, the drained weight shall be 64 per cent of the water holding capacity of the can unless otherwise agreed between the manufacturer and the party.

For microbiological examination, a proportion of the pack shall be incubated at 37°C and 55°C.

Sun-dried and salt cured fish. In dry salting of fish^{13, 18, 26, 27}, the entrails and gills are to be removed from fresh fish. The final product shall not have more than 35-45 per cent moisture, 1.5 per cent acid insoluble ash. Its sodium chloride content shall not be less than 25 per cent. For fish dried in sun^{24, 25} such as white baits (*Anchoviella spp*), the requirements are moisture (max) 15.0 per cent, sodium chloride (max) 2.5 per cent, acid insoluble ash (max) 7.0 per cent.

The fish meal. The meal shall be produced from fresh fish and fish wastes. It shall be free from adulterants, insect or mite infestation and salmonella. The fish meal shall not have more than 10 per cent moisture content and 10 per cent fat content. Its protein content shall not be less than 60 per cent for grade I and 50 per cent for grade II. Acid insoluble ash content shall be maximum 3.0 per cent for grade I and 5.0 per cent for grade II.²⁸

The incorporation of fish meal in poultry feeds has become a regular practice which holds a promise for further expansion on a larger scale. Fish meal is a rich source of high quality protein and contains besides calcium and phosphorus, certain

growth factors which are necessary for maximum growth rate and hatchability in poultry. Since fish meal shows wide variation in its nutritional quality it is desirable that standards are laid down for assessing its overall protein quality by biological experiments such as protein efficiency ratio (PER) instead of mere determination of its protein content.

Sardine oil, shark liver oil, fish maws, fish fins

Sardine oil²³ shall be prepared from oil-sardine (*Sardinella longiceps*) or its offal. The product shall have no off odour and it shall be of light golden yellow colour. The other requirements in per cent (max) are free fatty acids as per cent oleic acid 1.0, moisture 0.5, iodine value (Wijis) 145-180, saponification value 185-205, unsaponifiable matter 2.0, refractive index 1.4739-1.4771. For **shark liver oil**,³² the requirements in per cent (max) are saponification value 150-200, iodine value 90-150, acid value 3.0, unsaponifiable matter 7.0, vitamin A 1000-6000 IU/g and vitamin D₂ or D₃ 100-600 IU/g.

For **shark fins**,³⁰ it is necessary that all flesh attached to the fins is removed. The fins may be dusted with salt and a little lime and kept for about 24 hours. The fins after washing with water are dried to a moisture content of not more than 10.0 per cent. The dried fins are then to be graded according to size ranging from 10 cm or below to 40 cm or above.

Fish maws²⁹ is one of the most important exportable commodity prepared from air bladder of fishes. The air bladder shall be washed thoroughly in clean water and dried to a moisture content of not more than 8.0 per cent. It is then graded as count per kg from 15 or below to 100 or above.

Fish with darker meat produces more quantity of histamine than white meat. Maximum amount is produced at about 20°C while little is produced at 35°C. Besides

histamine, related compounds are formed which are more toxic or act synergistically and activate physiologically with effect of histamine. Since histamine is toxic to system, it is desirable that standards are laid down for this particularly so as the fish are usually inadequately iced and the temperature of fish is around 20°C.

Also *Vibrio-parahaemolyticus*, a pathogenic organism, grows faster around 10°C and as such, because of inadequate icing of fish, it is desirable that this is given due importance to prevent any health hazards. Some fish like Bombay duck (*Harpodon nehereus*) contain sometimes parasitic complaints. It is desirable to go more deep in this direction to find out ways and means of eliminating parasites from fish.

The quality of salt used in fish processing plays an important role. Higher calcium and magnesium sulphate content in salt impart an unpleasant flavour to fish. Cupric ions particularly activate amino sugar browning reaction and for this reason, the use of salt containing less than 0.2 ppm of copper is recommended. Salt of 98.0 per cent purity has been suggested.³¹

Additives permitted for use other than sodium chloride are mono-sodium glutamate, acetic acid, tartaric acid, citric acid, edible type colours for imparting pink colour to cooked shrimp.

In the preparation of these standards, due consideration has been given to the provisions of the Prevention of Food Adulteration Act 1954 and the Rules made thereunder.

Standards in preparation are for: canned crab meat,^{35a} canned clam meat, frozen frog legs (revised), frozen lobster tails (revised), basic requirements for a stall for sale of fresh fish, frozen cuttle fish (squids), procedure for checking temperature of quick frozen fish etc.

Standardized products are most important in the attainment of success of fish and fish products both for internal and external

markets. For this purpose, proper certification, inspection of the premises concerned and implication of tentative standards are necessary.

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Book Reviews

Food Analysis: Theory and Practice: by YESHAJAHU POMERANZ AND CHIFTON E. MELOAN, published by the AVI Publishing Company, Inc., Westport, Connecticut, 1971, pp. 669.

The book is a useful survey of modern analytical techniques and instruments. Emphasis is more on basic principles rather than on details of analytical methods. Instrumental methods making use of modern and sophisticated instruments have been given a wider coverage, and in addition contains classical procedures practised for many years. The subjects covered in the book are based on the report of the Task Force on Food Analysis of the Institute of Food Technologists' Council Committee on Education. For an understanding of the book, a good knowledge of general, organic, analytic and food chemistry, and biochemistry is pre-supposed.

The book has been divided into three sections—general (chapters 1-4), methods and instrumentation (chapters 5-31), and application and chemical composition (chapters 32-38).

Searching of literature forms the subject matter of the first chapter. Extensive references are given to source materials. The second chapter deals briefly with sampling in food analysis, terminology used, statistical concepts, manual and continuous sampling and sampling errors. The third chapter on preparation of samples covers necessary steps prior to analysis like grinding, enzyme inactivation, minimizing of lipid changes and controlling of oxidative and microbial attack. The fourth chapter relates to various methods of reporting results and checking the reliability of analysis by statistical methods.

Section two, covering chapters 5-31, is devoted to methods and instrumentation. In the instrumental methods of analysis, the authors have attempted to elucidate the theory required for understanding the principles of each instrumental assay. Almost every instrument and method used in the present day food analysis like spectroscopy (visible, U.V., I.R., N.M.R., mass); measurement of colour of foods, fluorescence and phosphorescence; flame photometry; X-rays; potentiometry; coulometry; conductivity; electrophoresis; polarography; radio-activity and counting techniques; column, paper, thin layer and gas liquid chromatography; extraction; centrifugation; densimetry; refractometry; polarimetry; rheology; serology, immunochemistry and immunoelectrophoresis; enzymatic and analytical microbiological methods are given. Figures and description of typical instruments are included to provide information on their application and precision. Examples given and applications cited in food analysis are instructive. Questions included at the end of each chapter stimulate the interest of the reader.

In chapters 32 to 38, which are included in Section III, determination of moisture, ash, minerals, carbohydrates, lipids, nitrogenous compounds and objective versus sensory evaluation of foods are discussed.

In writing this book, the approach of the authors is to examine and discuss the various methods of analyses rather than giving details of methods. This method of approach stimulates the interest and enables selection of a suitable method depending on the facilities available. Each chapter has illustrative figures, useful tables and bibliography and an index is included in the

end. As stated by the authors, the book is not intended to replace the standard books on analysis, but well serves the purpose as a useful reference text for those seeking principles and application of methods in food analysis rather than the procedural details.

S. RANGANNA

Food Dehydration, Volume 2—Practices and Applications: by W. B. VAN ARSDEL, M. J. COPLEY AND A. I. MORGAN, JR., The AVI Publishing Co., Inc., Westport, Connecticut, 1973, pp. 529, tables 58, figures 119, Price: domestic \$28 and foreign \$29.

Second edition of the book published after a gap of nine years has been updated in contents of various chapters in addition to including two extra chapters on (i) drying cereal grain and other field crops and (ii) intermediate moisture foods. Some of the important aspects included in the revised edition relate to (1) optimum moisture content as related to product stability, (2) replacement of tray and tunnel driers by continuous belt driers, (3) commercial use of Aire Freez process for cross cut green beans, celery, corn, bell peppers and pimientos, (4) drastic reduction of cooking time of dehydrated vegetables by subjecting them to ionizing radiations, (5) use of microwave, foam and osmotic drying techniques for fruit juices, (6) iron catalysed oxidation of sulphur dioxide on charcoal as the oxygen removing process resulting in oxygen levels of packages undetectable by gas chromatography, (7) development of meat based intermediate moisture snack foods, (8) need for the development of continuous freeze drying process at ambient pressure, (9) azeotropic freeze drying process for fish, (10) better understanding of quality deterioration processes for stored products and suggested remedies, (11) reverse osmosis process for

concentration of egg white and (12) introduction of freeze drying process for instant coffee and continuing with spray drying for instant tea.

In view of continuous rising costs of publishing books, economy in the use of paper has been attained by resorting to reduced print size and consequent covering of increased subject matter in reduced number of pages. Overall quality and general get up of the book, however, is still very good.

The book will find useful place in the libraries of Agricultural Universities, Food Science and Technology institutions and Government organisations connected with the subject.

B. S. BHATIA

Food Science: by PROF. NORMAN N. POTTER, published by the AVI Publishing Company Inc., Connecticut, 1973.

Ever since the text book on 'The Chemistry and Technology of Food and Food Products' edited by M. B. Jacobs ran out of print, the students initiated into the discipline of food science and technology were experiencing the hard felt need for an authoritative book on the subject so essentially required. To this extent 'Food Science' by Norman N. Potter of Cornell University published under the banner of The AVI Publishing Company Inc., in the year 1968 was a welcome relief. The very fact that in less than five years a second edition had to be brought out proves that the work has been well accepted by the academic world.

In the introductory chapter the author makes an attempt to define the oft repeated term of 'food science'. The requirements for a course in food science are discussed. The author pleads for including courses in English, Mathematics, Statistics, Physics, Biology, Microbiology, Humanities and

Chemistry so that the general background of those qualified will be very sound which will enable them to appreciate the problems in a better perspective. Whereas a food technologist is primarily involved in acquisition of knowledge and its professional application, a food scientist, besides having same qualifications, acquires additional knowledge and skills that will enable him to develop new knowledge of a basic nature. According to the author scope of activities of food scientists includes development of cheap sources of products for supplementing the deficient diets, specialised foods for adverse conditions, simulation of popular foods using cheap food materials, fabrication of new foods, controlled atmosphere storage of perishable foods, mechanical harvesting of crops, improvement in processing of foods, and many other developments leading to improvement of existing foods and cutting down avoidable wastes.

The second chapter is entitled 'Magnitude, Division and Interdependent Activities of the Food Industry'. The author impresses on the size of food industry in USA. It is interesting to note that the consumers in USA spend as high as 29.6 per cent of their total food bill on meat and 18.1 per cent on dairy products. The author emphasises the triple functions of the industry viz. raw material acquisition, manufacture and distribution, all of which have to be co-ordinated. Examples are given with respect to bread and frozen orange juice concentrate production.

The properties and significance of various constituents of food such as carbohydrates, proteins, fats and others are discussed in chapter 3. Additional food constituents such as emulsifiers, organic acids, oxidants and anti-oxidants, enzymes, pigments and colours, flavours, nutrients and water play different roles in a variety of food products and these aspects have also been covered in this chapter.

Food scientist/technologist cannot ignore the nutritional aspects of foods handled by him when processing considerations are discussed. In order to have a better understanding of the above problems, the author gives a brief idea in chapter 4, regarding the energy concept *vis-à-vis* the roles played by carbohydrates and lipids present in the food. The importance of quality and quantity of proteins to be consumed for proper maintenance of good health has also been discussed. The contribution by micronutrients such as vitamins and minerals to the usefulness of food products has been explained. A brief report on the nutrient stability and effect of processing on food nutrients is included which gives an idea regarding the losses incurred due to improper processing techniques.

The fifth chapter begins with a list of unit operations that are encountered in the food industry. In the following pages the author attempts to give an idea regarding the various unit operations with the help of appropriate sketches and photographs.

Quality consideration weigh predominantly with the consumer in his selection of any consumable item. It is of paramount importance that the food manufacturers maintain uniform quality for their products from batch to batch. The parameters for quality assessment vary from one food to another. The factors influencing the senses include appearance, texture and flavour. The importance of these factors and their quantification are discussed in chapter 6.

Food is highly susceptible to deterioration because of a number of reasons. The quality deterioration could be due to microbial infection, destructive natant enzymes, pests, insects, rodents, temperature range, moisture variation, presence of oxygen, light etc. These factors as well as

ways and means to control such deterioration are discussed in brief in the seventh chapter.

One of the oldest methods of food preservation is by application of heat. The effectiveness of heat treatment depends on a number of factors such as duration of heating, type of food to be preserved and nature of microorganisms normally encountered. The author has been able to cover the conventional heat processing methods as also the modern developments in the field in chapter 8.

In chapter 9, preservation of food by removal of heat, that is, by refrigeration and freezing has been discussed. Besides, explaining the requirements of refrigerated storage, the available data on the optimal cold storage conditions for a number of perishable foods have been presented. Modifying the gas atmosphere during storage helps in prolonging the life of some of the perishable products significantly. The various methods commercially used for temperature reduction are discussed. Some of the adverse effects of this method of preservation have been explained.

Preservation by removal of water is considered the cheapest way of preserving foods. Many food products can be preserved either by partial (concentration) or complete removal of water (dehydration). The various factors influencing the heat and mass transfer are discussed in chapter 10. Also included in this section are some details about the different types of drying equipments available today. An interesting topic which has found place in this chapter is intermediate moisture foods and their technology.

In chapter 11, the author deals with two modern technologies viz. Food Irradiation and Microwave Heating. The discussions on irradiation includes the type of sources available, mechanism of action, dose determination, cost calculations, safety aspects

and futuristic considerations. In the brief section on microwave heating the author discusses the properties of microwave, microwave generators and the applications of microwave in food industry.

Preservation by use of microorganism is fairly practised in case of several food materials. In chapter 12, the various types of fermentation helpful in food preservation are discussed in brief.

The next six chapters (13-18) have been devoted to some of the commonly used commodities which include milk and milk products, meat, poultry and eggs, sea-foods, fats, oils and their products, cereal grains and fruits and vegetables. Satisfactory coverage is given as far as chemistry and technology of these commodities are concerned.

Beverages form one of the most frequently consumed groups of processed foods. Clubbed under this category and discussed in detail in chapter 19 are carbonated non-alcoholic beverages, mildly alcoholic beverages such as beer and wine and stimulating beverages such as coffee and tea.

A brief idea about the chemistry and technology of confectionery and chocolate products is given in chapter 20. The processing of cocoa beans is also covered in this section.

Packaging is one of the most important operations requiring full attention if the product is to have a good shelf-life. This area has developed so much in the last few years that today packaging technology is a subject by itself. Requirements and functions of containers, various types of containers and packaging materials, testing of packages etc. form the subject matter of chapter 21.

While water is highly essential for various food processing operations, its quality will have a bearing on the product manufactured. Similarly the processing wastes from food industry is a potential source of pollution

and unless they are treated properly to remove the bulk of organic matters, their disposal becomes a major problem. These aspects are covered in chapter 22.

Food additives encompass a wide range of chemicals used for a variety of purposes by the industry. The author discusses in chapter 23 the current status of these additives, *vis-à-vis* the various rules and regulations in force in the United States. The role of Codex Alimentarius Commission of the United Nations in formulation of International Food Standards is also discussed here. Improvement of nutritional quality of foods forms the subject matter of chapter 25. In the last chapter (25), the author makes an effort to assess the world food needs and discusses the various programmes currently in practice to bridge the gap between demand and supply.

It has to be admitted that the book with 706 pages contains a wealth of information that can be useful to anyone being initiated into the field of food technology. It may be worthwhile for the publishers to examine the possibility of bringing out a cheaper edition primarily intended for students in Asia and Africa. Moreover, if reasonably priced this can be a popular source of information even for laymen interested in educationing themselves regarding the food they consume.

V. H. POTTY

Integrated Food Processing in Yugoslavia: published by United Nations. Copies available with United Nations, Sales Section, New York, pp. 120, US \$ 2.00.

This publication contains the report and digest of papers presented at the Seminar on Integrated Food Processing organised by UNIDO in Navi Sad, Yugoslavia,

between 14-28 November 1968. 20 developing countries participated.

Integrated agro-industry is a modern effort to industrialise human activities. Food Processing industry to a great extent depends on the farmer.

There are 13 chapters dealing on Techno-Economic Aspects of Agro-industrial Development; Agro-Industrial combine in Yugoslavia, Organisation of Agro-industry; Mechanisation; Production of Field and Forage Crops; Production of Fruit, Meat, Poultry and Egg; Quality Control Research; Marketing and Staff Training.

Annexures give the Opening Statements by Mr George Abu Jawdeh, Deputy Resident Rep. of UNDP in Yugoslavia and Mr A. V. Bassili, Industrial Development Officer, UNIDO, the list of participants from various countries and papers presented.

Wood as a Packing Material in the Developing Countries: published by United Nations. Copies available with United Nations, Sales Section, New York, pp. 111, US \$ 2.00.

This is the report by Mr Bernard Hochart, Consultant to UNIDO, on a study conducted by him on the types of wooden containers. The publication contains seven interesting chapters dealing in recent developments in Packaging; Characteristics of Spices used in the Packaging Industry; types of Packing cases; Standardisation, Laboratory Tests and Quality Control; Manufacturing; International Regulations; activities and documentation; Trends in the use of wood for Packaging in developing countries. The annexure lists the research laboratories in several countries and gives interesting list of Bibliography.

NOTES and NEWS

- *Canning of Ber (Zizyphus maurandia Lam.)*
- *Food Information—Cakes and Cans*
- *Abolishment in Food*
- *Development in Food and Allied Industries*
- *Human Nutritional Requirements*
- *Preservation—Industry Group (P.I.G.)*
- *Industrial Inquiry Service*
- *Industrial Credit and Development Corporation of India*
- *National Committee on Science and Technology*
- *Consumer Prices*
- *Cooking Time Table*

Canning of Ber (*Zizyphus maurandia* Lam.)

The ber is an important indigenous fruit of India. It is widely grown in the northern region and the total estimated area in the country under this fruit is about 24,497 acres.¹ No product has been prepared on a commercial line even though some workers have reported that a good candy can be prepared from ber.^{2,3} Scarcely, the unmarketable fruit is dried in the villages. No work has been reported on canning of ber. Recently an attempt has been made in this laboratory to find out the suitability of ber fruit for canning.

The uniform slices of the Katta variety of ber were canned in 3 lb. jam size (361 × 305) cans using cane sugar syrup of 20, 30 and 40 per cent of sugar containing 0.5 per cent citric acid in each case.

The cut-out analysis of the canned ber were carried out after 31 weeks storage

at room temperature (15° to 30°C). The method of cut-out analysis followed was the same as described by the Fruit Products Order, 1955. The organoleptic evaluation of the canned ber slices was done by panel of seven judges.

The per cent (Table 1) drained weight was lowered with the increase in the sugar content in the syrup. This may be due to greater translocation of water from fruit into the syrup as reported by Ross, Bedford and Robertson⁴ also found that the cherries canned in 20 or 30 per cent syrup had higher drained weight than those of canned in 40 or 50 per cent syrup.

The inside condition of the cans was good and no fracturing was observed.

TABLE 1. Chemical examination of canned ber slices in different sugar syrups (31 weeks at R.T.)

	Cane sugar syrup		
	20%	30%	40%
Type of can	Plum	Plum	Plum
Size of can	361 × 305	361 × 305	361 × 305
Vacuum (Inches)	14	12	11
Head space "	1	1	1
General condition of can	good	good	good
Drained wt. %	61.8	61.8	61.2
Organoleptic quality (F) Colour	Not so acceptable	fair	fair
Flavour	fair	fair	fair
Taste	fair	fair	good
Total soluble solids (%)	18.7	22.8	26.7
Clarity of syrup	normal	normal	normal
Fructose (mg. 100 ml)	51	15	14

R.T.—Room temperature (F)—Fruit, cut-out

fruit showed better colour when packed with 30 or 40 per cent syrup than 20 per cent syrup. Flavour was more or less similar in 20 or 30 per cent syruped fruits but 40 per cent syruped fruits obtained more score for flavour. This may be due to the high sugar syrup, as reported by Van Bluricom⁶ that the sweetness considerably influences the flavour of a canned product. The texture was better in the fruit packed with 40 per cent sugar syrup than fruit with 20 or 30 per cent sugar syrup. The overall organoleptic evaluation of canned ber by a panel of tasters shows the acceptability of the product by giving the average scores 5.4, 5.7, and 6.6 out of 10 in respect of fruit canned with 20, 30 and 40 per cent sugar syrup respectively. However, the product packed in 40 per cent syrup was found better.

Ber slices canned with 40 per cent sugar syrup have been found better than those canned with 20 or 30 per cent syrup. The canned product can be stored nicely for 31 weeks at R. T. (18°-30°C) in respect of colour, flavour and texture.

The author is indebted to Dr R. N. Singh, Head of the Division, for his keen interest and encouragement.

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D. S. KHURDIYA

Food Adulteration—Causes and Cures

A National Seminar on 'Food Adulteration—Causes and Cures' was held in the India International Centre, New Delhi, on 16th and 17th of December 1974. Mr S. M. Sikri, former Chief Justice of India, presided. The Seminar was attended among others by Mr Triloki Singh, Chairman of the Select Committee of 69 members of the Parliament constituted to consider the Food Adulteration (Amendment) Bill 1974, prominent members of Parliament, representatives of organisations connected with the Food Industry and consumers; Municipal Health Officers; Scientists and officials of the Ministries of Agriculture and Health; advocates specialising in laws regarding Prevention of Food Adulteration and the general public. The main thrust of the Seminar was to pinpoint the principal forms of adulteration and to consider ways of effectively curbing the evil.

Delivering the Keynote address, Mr S. M. Sikri said that P.F.A. Act affected everybody, the humblest and the highest, the poorest and the richest, alike because everybody must eat and drink. A consumer would like to be assured of a wholesome article of food to which nothing deleterious, substandard or injurious to health has been added. He is completely at the mercy of the manufacturer, distributor and the dealer. On the other hand the law should not be so severe as to drive the manufacturers etc. out of business. The packaging of food commodities in the best possible manner to prevent adulteration and contamination at any point becomes important. Labelling and advertising must be truthful.

The core of an Act dealing with adulteration of food is the definition of the term or concept of 'adulteration'. There cannot be any dispute that anything which is injurious to health should be deemed adulteration. He was of the view that a

law should not compel the courts for imposition of a minimum sentence. The punishment should be tailored according to the gravity of the offence. He was inclined to think that Parliament should seriously consider setting up of a different kind of enforcement agency than that existing at present. Before prosecutions are launched for violation of the law, persons against whom such proceedings are contemplated should be given an opportunity to present his views. In minor cases or technical irregularities, just a warning is enough. The selling of an article of food by a manufacturer or distributor or dealer, evidenced by a cash memo, a warranty that the article is not adulterated or misbranded within the meaning of the P.F.A. Act is implied.

Addressing the Seminar, Mr Triloki Singh stated that the Government and the Parliament were seized by the gravity of the problem of food adulteration. He cautioned that unless decentralisation of power took place on large scale and people were involved in the enforcement of all developmental activities, including the implementation of the Food Adulteration Act, the efforts of the Select Committee would not yield the desired result. Mr Singh pointed out that if the P.F.A. Act in the case of Milk was strictly enforced, no dairy in India would be able to function for a single day. This is so because the dairies depend on external supplies. The health of the citizen must be given priority. Shri Triloki Singh emphasised that the Joint Select Committee would do its utmost to plug the loopholes in the legislation dealing with food adulteration and the evidence collected would be properly utilised.

Dr Surinder P. S. Pruthi, Economic and Corporate Management Consultant, stated that adulteration emanates primarily from the situation of shortages and the concomitant of shortages is high prices.

Another reason is the inefficient implementation of the food laws. This is partly because of the inequality of personnel and partly because of the loopholes in law but mostly because of corruption.

Dr Pruthi said that our knowledge of adulteration is vague, artificial and all-pervasive. The definition must incorporate clear details with regard to products which are injurious and not injurious to health; products in which one detects deliberate intent to adulterate and adulteration which cannot be observed by naked eye because of situations emanating from processing or hygienic hazards. In the case of wilful intent, punishment should be the severest possible.

Conclusions and recommendations

- (1) The authorities were urged to keep the contemporary socio-economic realities in view before enacting new legal measures.
- (2) The food standards should constantly be reviewed and revised.
- (3) There should be public participation and greater coordination between the government bodies concerned with food adulteration.
- (4) The government should allocate adequate funds to curb the menace of adulteration.
- (5) The enforcement machinery should be strengthened and streamlined and qualified persons induced into the organisations.
- (6) More and better equipped food testing laboratories should be set up to ensure speedy and fair disposal of cases and uniformity in testing standards.
- (7) The Central Council for Food Standards (CCFS) should revise the current food standards after taking into account limitations

such as natural causes, manufacturing hazards and the primitive marketing practices prevalent in the country.

- (8) The law should differentiate between articles which are adulterated (hazardous to health) and articles which are off-standard (not hazardous to health). Punishment should be awarded for wilful intention and for adulteration injurious to health. Penalty should be flexible according to the gravity of the offence.
- (9) The term 'incharge' should be clearly defined to prevent harassment to directors or partners who are not directly concerned with the day-to-day business.
- (10) The courts should be left free to fix punishment in the best traditions of justice taking into account the motive and the intention of an accused person.
- (11) Offences related to articles which are 'off-standard' due to natural or other causes beyond human control such as soil deficiency, climatic conditions, storage problems, hygienic conditions and manufacturing hazards should not be included with the serious crime of intentional adulteration.
- (12) The Government of India should lay down clear and uniform guidelines for the enforcement bodies and the State Governments should be urged to take active interest in the matter and see that the local bodies implement the law in accordance with the central guidelines.
- (13) The basic guarantee or warranty in respect of quality should come primarily from producers, manufacturers, packers, wholesalers or

distributors. Public Sector undertakings like Food Corporation of India should also endeavour to provide warranties for the foodgrains distributed by them.

Adulteration in Foods

The Bangalore Chapter of the Association of Food Scientists and Technologists held a day's Symposium on 'Adulteration of Foods' on 14-12-1974.

The First Session was moderated by Shri Panduranga Setty, President, Association of Food Scientists and Technologists, Bangalore. Dr K. C. Naik, Technical Director, Clean Foods Corporation Ltd., spoke on Adulteration in Raw Materials; Dr B. L. Amla, Director, C.F.T.R.I., Mysore, dwelt on Adulteration in Processed Foods; Dr S. Varadarajan, Chairman, Indian Petro-Chemicals Corporation Ltd., Baroda, discussed Adulteration as it affects Manufacturers.

Shri G. V. K. Rao, Chief Secretary, Karnataka Government, conducted the Second Session. Dr C. P. Hartman, Public Analyst, Karnataka State, spoke on Prevention and Standards; Shri C. G. Rama Rao, President, All Karnataka Hoteliers Association, discussed Adulteration as it affects Retailers. Smt. M. R. Lakshamma and Shri V. T. Sreenivasan dwelt on Adulteration as it affects Consumers.

Dr K. T. Achaya, Executive Director, Protein Foods and Nutrition Development Association of India, Bombay, formulated the recommendation and resolution after discussions on Primary Foodstuffs, Processed and Packaged Foods, Legislative Action and Consumer Action.

The Symposium has recommended that All Public Health, Municipal and State Government laboratories should be modernised with up-to-date instrumentation. Every district in every state must

have an analytical laboratory and should also undertake commercial analysis.

To reduce packaging costs, both manufacturers and research laboratories should work towards innovative and cheap packaging. For many powders or solid foods, paper and foil packaging is sufficient. For items like vegetable oils, the possibility should be explored of dispensing units, just like petrol pumps, which are operated by manufacturers and dispense brand-name products into the consumers own containers. A similar scheme is being considered for milk distribution by the National Dairy Development Board.

Every manufacturer should employ a qualified food technologist for internal quality control. Alternatively government-appointed technologists could be considered for placement in each food industry, as is now done under the Agmark scheme.

It is suggested that the amended Act now being considered by a Joint Parliamentary Committee should be called the Food Safety and Quality Act and administered by the food department rather than by the health authorities.

The Act should be so framed as to be not just a preserving authority, but an advisory and educating one. There should be distinction between sub-standard and adulterated foods. The former should be dealt with through show-cause notices and fines, while the latter should attract much stronger penalties.

Entrepreneurship in Food and Allied Industries

Mr A. S. Melkote, Director, Administrative Training Institute, Mysore, has urged the youth to change their attitude towards jobs and prepare to assume responsibility for roles they are not accustomed to.

Mr Melkote was addressing the trainees at the valedictory function of the first

course on 'Entrepreneurship in Agro-based Food and Allied Industries', at Central Food Technological Research Institute, Mysore, on 12th January 1973. He deplored the attitude that working with one's own hands was unfortunately looked down upon by the society and educated people in India. So long as this attitude continued no amount of assistance and guidance given by the Government would be of any help in placement of youths.

Commending the training conducted at C.F.T.R.I., Mr Melkote said that this should be of help in starting small industries. He agreed that starting of an industry was not an easy task and one had to confront with formidable problems in the initial stages. Sustained effort and tremendous will-power were the prime necessities to overcome the initial difficulties and develop the industry. The first group of trainees would need to do pioneering work to launch small scale industries in their respective districts.

Presiding over the function, Mr Nawal Kishore Singh, Youth Coordinator, Nehru Yuvak Kendra, Munaffarpur (Bihar) said that there was a lot of scope for channelising the energy of youth in the country for constructive purposes. By providing educated youth with knowledge and opportunities for self-employment, it would be possible to generate enough momentum for harnessing the industrial potential of the country. He complemented the Union Education Ministry and C.F.T.R.I. for their combined efforts in running the training programme for the youth leaders and hoped that this was only a beginning.

Mr Melkote presented certificates to 15 youth leaders from Munaffarpur and Champaran Districts of Bihar who attended the first training course. There were short training courses will be held for the youth leaders from other districts of Bihar. 100 youth leaders from various districts

er would be trained under the scheme training of youth leaders sponsored by Union Ministry of Education and Social Welfare (Department of Education) as a part of the National Youth Programme.

Mr S. C. Bhattacharjya, Scientist, Industrial Research, Consultancy and Extension, C.P.T.R.I., presenting the report of the course said that apart from lectures and practical training, the trainees were taken on field trips to food processing units and industries. Mr Bhattacharjya disclosed that on the completion of the course the trainees would visit several areas in which they would be required to start industries when they return to their places. They included dal milling, poultry farm and poultry feed, small flour mill and bakery, preparation of fruit and vegetable products, oil milling, dry grinding, grain storage services and Indian made design liquor. Mr Bhattacharjya said that know-how and technical assistance needed for small and cottage scale food industries would be provided to the trainees if they so desired.

Human Nutritional Requirements

The World Health Organization and the Food and Agriculture Organization have published a 70-page 'Handbook on Human Nutritional Requirements'. According to the publication every 20,000 young children permanently blind because of the lack of minute amounts of retinol (vitamin A) in their diets. Mothers who are over-zealous for the nutritional well-being of their children actually poison them with excessive doses of vitamins A and D.

Retinol or vitamin A is one of the organic substances which the body needs in small amounts and yet cannot make for itself. The term vitamin was introduced in 1912 by the Polish biochemist Casimir Funk in the belief that all these substances were 'Vital amines'. Retinol is an alcohol and aldehyde derived from

it is an essential part of visual purple. This pigment is bleached by light, a process which stimulates the rods in the eye, thus enabling a person to see in dim light.

Vitamin A deficiency leads to night blindness, which is common in many parts of South East Asia, the Middle East and tropical Africa and results in a softening of the cornea or keratomalacia. This condition occurs at any age but is usually found in children as a complication of severe forms of protein-calorie malnutrition.

Liver is a rich source of vitamin A, which is also present in milk, butter, cheese and eggs. The body can also manufacture the vitamin from carotenepigments contained in carrots, dark-green vegetables and dark-coloured fruits.

Vitamin D, or cholecalciferol, is essential for growing children if the deficiency disease rickets is to be avoided. Cod liver oil was one very old household remedy and is a good source of this vitamin, while other fish, liver, eggs and butter contain useful amounts. A daily intake of 10 micrograms for children up to their birthday is enough to prevent rickets.

With the decline in breast-feeding associated with urbanization in almost every city of the world, there is an increasing use of artificial milk products often as the sole source of food for infants. Under these circumstances cases of infantile scurvy can be expected due to lack of vitamin C or ascorbic acid. Such cases can be prevented by making fruit juice and green vegetables readily available.

The Handbook deals in detail with vitamins B₁ (thiamine, contained in yeast and whole cereal grains), B₂ (riboflavin, found in yeast, meat, eggs and fish) and B₁₂ (cyanocobalamin of which the only rich source is liver) as well as niacin (from

meat, whole cereals and pulses) and folates (mainly from leafy vegetables). It also assesses the body's needs for energy and for proteins.

Calcium (occurring in milk products and fish), iron (meat, poultry, fish, whole cereal grains and green or yellow vegetables), iodine (in sea-foods and certain vegetables) and fluorine (in sea-foods and tea) are all given separate treatment.

Protein-Calorie Advisory Group (PAG)

The FAO, WHO, UNICEF, IBRD and UN which had formerly sponsored the Protein Advisory Group has widened its scope and christened the organisation as the Protein-Calorie Advisory Group of the United Nations (PAG).

PAG activities since 1955 have placed emphasis on protein-calorie malnutrition as a primary and continuing threat to the health and survival of infants and young children, on locally available sources of protein and their use in combating malnutrition. PAG has given attention to socio-economic considerations, to trends in world food supply and consumption, and to the need for governmental initiatives and priorities in dealing with these problems.

The range of subject matter undertaken by the PAG includes definition of needed nutrition policies and planning, methods and approaches to planning, analysis and advice related to programmes and issues of strategy, recommendations regarding resource allocation for such programmes. PAG will advise on technical, social and other related areas of activity, provide guidelines for the formulation of broad programmes of the United Nations System of Organisations involved with various aspects of the problem of malnutrition.

The PAG will continue its role in identifying and monitoring developments in

novel protein resources and protein foods designed to meet the needs of vulnerable low income populations.

Members of the group appointed to serve for the 1974 and 1975 represent the disciplines of nutrition, pediatrics, public health and food and agricultural science and technology, and other social sciences, economic policy-making and planning, anthropology, sociology and education.

The 22nd PAG session met at FAO, Rome, in June 1974 and emphasised the theme, namely, selection among alternate nutrition strategics and programmes data required for decision and evaluation. The new meeting will enable the PAG to analyse the issue from various angles.

The Group reviews and approves the recommendations of various PAG *ad-hoc* working groups which consist of specialists who deal with specific technical problems such as those relating to feeding the preschool child, nutritional improvement of staple food crops by genetic methods and other technologies, nutritional and safety standards required for novel protein sources such as those produced from hydrocarbons and underutilised oilseed protein residues, and identification of the research priorities in these various fields.

Present Chairman is Dr Joaquin Cravioto of Mexico and the Vice-Chairman is Dr M. S. Swaminathan of India. The PAG Secretariat is headed by Dr Max Milner, Scientific Secretary and Director. The Secretariat is located in United Nations Headquarters, New York.

Industrial Inquiry Service

The UNIDO Industrial Inquiry Service (IIS) provides practical assistance to developing countries by offering solutions to inquiries on problems in industry. Technical and industrial knowledge needed

by developing countries is available in the industrialized nations and UNIDO is well placed to tap such information for their benefit. The number of inquiries increased from 80 per month in 1969 to 300 per month in 1973.

UNIDO has dwelt on questions dealing with programming and management problems, requests for consultants, training, promotion and on food industries. The number of inquiries dealing with food industries was the largest during the period 1966 to 1973.

The largest number of inquiries concerned with addresses of manufacturers of industrial equipment, exporters and importers of different goods, statistical and marketing data, publications, problems on management and programming. 1971-1973 showed a significant growth of inquiries dealing with the food and chemical industries.

The IIS receives inquiries related to all possible aspects and stages of industrial development, questions of interest to industrial development ministries in formulating plans, or heads of industrial enterprises needing information to improve the operation of their factories, requests for rudimentary descriptions of industrial processes or for information on new breakthrough in certain advanced technologies.

The answers provided to inquirers mostly represent the first contact between industrialists, executives and organizations in developed and developing countries. In many instances these first contacts have lead to bilateral projects or requests to UNIDO for technical assistance.

Industrial Credit and Investment Corporation of India

The Industrial Credit and Investment Corporation of India Limited completed 20 years of operations in the field of development financing on January 5, 1975.

During the two decades of its existence, ICICI has provided funds exceeding Rs 500 crores to cover 900 enterprises by way of underwriting and direct subscription to shares and debentures and rupee and foreign currency loans.

Of the ICICI-aided units, over 300 were launched with funds from ICICI and more than 100 units were started by entrepreneurs for whom it was their first industrial venture.

ICICI-aided projects cover a wide range of industries, mainly non-traditional.

ICICI has been a significant source of finance in obtaining imported equipment for industries in India. It was instrumental in obtaining \$335 million in 10 lines of credit from the World Bank—the largest amount extended by the Bank to a development Bank. It also obtained 13 lines of credit aggregating DM 115 million from KfW of the Federal Republic of Germany. Also, ICICI has raised foreign currency loans through the U.K. government credit, USAID and the Euro-currency market.

National Committee on Science and Technology

The Government has decided to appoint Shri P. N. Haksar, Deputy Chairman of the Planning Commission, as the Chairman of the National Committee on Science and Technology (NCST). Shri Haksar will also be the vice-president of the Council of Scientific and Industrial Research (CSIR). The Secretary of the Department of Science and Technology, Dr A. Ramachandran, will be vice-chairman of NCST.

The takeover of the NCST chairmanship by Shri Haksar is expected to promote co-ordination between NCST and the Planning Commission. The science and technology plan drafted by NCST is

being finalised in consultation with various Union ministries.

Exact allocation of research and development for each Ministry is to be decided after NCST concludes its present round of talks with the ministries and the Planning Commission.

With the new arrangements, it is hoped that the science and technology plan will be dovetailed into the Fifth Plan so that various spheres of economy will get a boost from research and development activities in the country.

Consumer Prices

Figures from 126 countries and territories show that consumer price increase was much sharper in 1974 than in 1973. This was revealed recently by data assembled by ILO. Food prices were largely responsible for the increase in developing countries.

Rates of increase more than doubled in 47 countries, and often reached their highest level for 20 years. Only a few countries had a slower rate of inflation in 1974 compared with the previous year, including Argentina, Haiti, Niger and Singapore.

Consumer prices went up by more than 20 per cent in 44 developing countries as well as in Iceland, Ireland, Italy, Japan and Yugoslavia. Increases exceeded 30 per cent in 17 countries and territories. In Cape Verde, Chile, Iceland, the Khmer Republic, the Philippines, Uganda and Uruguay consumer prices rose by more than 50 per cent.

India had a 30 per cent inflation rate for the first time in August 1974. Price

increases ranged between 10 and 20 per cent in 62 countries and territories—17 of them in Africa, 17 in the Americas, 9 in Asia, 13 in Europe and 6 in Oceania.

In the United States, prices went up by 12 per cent from November 1973 to November 1974, making the biggest 12-month jump since 1947. The United Kingdom had an annual inflation rate (17 per cent) which had not been equalled since 1945.

Cochin: Free Trade Zone

Kerala State Industrial Development Corporation Limited will establish a Free Trade Zone near Cochin. The industries set up in this Zone have to be hundred per cent export-oriented.

The Kerala State will afford all the facilities prevalent at the Kandla Free Trade Zone which include import of machinery without payment of duty; import of raw materials and components free of customs duty; purchase of excisable commodities required for production of goods without payment of Central Excise duty; exports free of Central Excise duty; no quota restrictions for import of raw materials; reduction of 50 per cent in application fees for import licences as allowed to those units in Kandla Free Trade Zone; availability of land at reduced rates. Electric power throughout the year and cheap labour are added advantages. More details be had from Development Commissioner, Kerala State Industrial Development Corporation Limited, Post Box No. 105, Trivandrum-1.

Export News

- *Export Credit*
 - *European Economic Community: Duty Free Imports of Processed Agricultural Products*
 - *Indo-Pak Trade*
 - *Blanket Foreign Exchange*
 - *Classification of Traditional and Non-Traditional Exports*
 - *Central Excise*
-

Export Credit

The Reserve Bank of India has decided to liberalise the terms of refinance for export credit to banks. The additional accommodation available varies from bank to bank. The guiding principle for additional assistance is the extent of the bank involvement in financing priority sectors. If RBI considers that a bank has deployed a sizeable portion of its lendable resources in priority sectors, the export credit refinance entitlement may even be doubled. At present, refinance for export credit is 10 per cent of outstandings as at the end of September last and any assistance over and above this 10 per cent is given on a discretionary basis.

The decision to liberalise export credit refinancing has been taken following the discovery by RBI that quite a few exporters have been denied adequate packing and post-shipment credit by banks for their own reasons. The task set up by the Commerce Ministry also came to this conclusion and recommended some liberalisation. A committee, under the chairmanship of Dr R. K. Hazari, Deputy Governor of RBI, has been set up on the basis of the recommendations of the Narasimham panel. This high-level panel will look into all aspects of export credit and also receive complaints from

exporters. The committee includes officials from the Finance Ministry, the Commerce Ministry, representatives of the Export Credit and Guarantee Corporation, a banker and some prominent exporters.

European Economic Community: Duty Free Imports of Processed Agricultural Products.

- 02.01** Meat and edible offals of the animals falling within heading No. 01.01, 01.02, 01.03 or 01.04 fresh, chilled or frozen:
A. Meat: III of Swine
B. Other:
- 02.04** Other meat and edible meat offals, fresh, chilled or frozen: ex B. Furred game, frozen
C. Other: ex 1. Frogs' legs
- 07.05** Dried leguminous vegetables, shelled, whether or not skinned or split:
B. Other: ex. I. Beans of the genus *Phaseolus mungo*
- 08.01** Dates, bananas, coconuts, Brazil nuts, cashew nuts, pineapples, avocados, mangoes, guavas, and mangosteens, fresh or dried, shelled or not: ex E. Desiccated coconut
- 08.05** Nuts other than those falling within heading No. 08.01 fresh or dried, shelled or not:
D. Pistachios
E. Pecans
F. Areca (or betel) and cola
ex G. Other (excluding hazelnuts)
- 08.11** Fruit provisionally preserved, for example, by sulphur dioxide gas, in brine, in sulphur water or in other preservative

solutions, but unsuitable in that state for immediate consumption:

C. Papaws

08.12 Fruit, dried, other than that falling within heading No. 08.01, 08.02, 08.03, 08.04 or 08.05:

E. Papaws

ex G. Others:

—tamarind (pods, pulp)

08.13 Peel of melons and citrus fruit, fresh, frozen, dried or provisionally preserved in brine, in sulphur water or in other preservative solutions.

Indo-Pak Trade

India and Pakistan lifted the embargo on trade between the two countries from December 7. It has been decided that trade is to be conducted in hard currency in accordance with the foreign exchange regulations of each country.

The two countries have extended the most-favoured-nation treatment to each other in accordance with the provisions of the General Agreement on Tariffs and Trade.

Initially, trade is to be conducted on a government-to-government basis or through public sector agencies. Private trade can take place by mutual agreement in specific instances. At a later stage, the private sector will be given a bigger role.

The fundamental basis of trade has been specified in the protocol signed at New Delhi on November 30. International vessels will ferry cargo between the two countries.

Experts of both sides will get together and work out details on shipping, so that firm basis can be laid for coastal exchanges before the trade plan is signed. Road and rail links will be taken up at a convenient time.

Blanket Foreign Exchange

The Reserve Bank has raised the limits of minimum annual export performance for issue of blanket foreign exchange permits for travel abroad for export promotion and other approved purposes.

The revised limits are Rs 75 lakhs for traditional exports, against Rs 25 lakhs, and Rs 15 lakhs for non-traditional exports, against Rs 5 lakhs.

The exporters who are registered as export houses with the Ministry of Commerce will be eligible for grant of blanket exchange permits irrespective of their past export performance, as hitherto.

Classification of Traditional and Non-Traditional Exports

The Ministry of Commerce, Govt. of India, vide office Memorandum No. 19 (42) 70-EAC dated 10-7-73, have published lists of products which are classified as traditional items of export and non-traditional items of export. In the Inter-Ministerial meeting held on 7th November, 1974, suggestions for classifying certain additional export products as traditional and non-traditional and transposition of some products inter-se were discussed and the lists have been revised.

Non-Traditional

- 4.1 Animal casings.
- 4.2 Canned and frozen fish.
- 4.3 Processed foods, fruits, vegetables, alcoholic and soft beverages.
- 4.4 Meat and allied products.
- 4.5 Packaged tea, i.e. tea packed in consumer packs of a size upto 1 kg and instant tea.
- 4.6 Instant and packaged ground coffee.
- 4.7 Ossein and Gelatine.
- 4.8 Tobacco manufactures.

- 4.9 Dry flowers, parts of dry plants and twigs used for decorative purposes.

Traditional Items

- 5.1 Gum and resins (natural).
5.2 Dried fish and fish meal.
5.3 Spices.
5.4 Guar gum (including refined and pulverised)
5.5 Tea (other than instant tea and packaged tea, i.e. tea packed in consumer packs of a size upto 1 kg).
5.6 Coffee (other than instant coffee and packaged ground coffee).
5.7 Curry powder and paste.
5.8 Oil seeds and kernels including cashew kernels, cashew nuts and walnuts.
5.9 Vegetable oils (non-essential) including medicinal castor oil, B. P.C.

Central Excise

Payment of drawback amount sanctioned in respect of drawback claims under Section 75 of the Customs Act, 1962, will be made by cheques, effective from 1-2-1975, as per Public Notice No. 25/1974. The cheques will be issued in respect of those consignments shipped (air lifted) on or after 1-1-1975. From this date the Exporter shall, at the time of filing the shipping bills under claim for

drawback under Section 75 of the Customs Act, 1962, pre-receipt the claim by affixing on the duplicate copy of the Shipping Bill a revenue stamp for the amount claimed by him as drawback. He shall make the following endorsement apart from the usual declarations on the duplicate copy of the Shipping Bill:

‘Received payment of Rs—— (Rupees in words)’

*Signature of Exporter
or his authorised agent*

In case the amount claimed and pre-receipted for by the Exporter or his authorised agent is higher than the amount sanctioned by the proper officer, the pre-receipted amount will be corrected and initialled by the proper officer and if the amount claimed and pre-receipted for is lower than the sanctioned amount, a fresh pre-receipt for the sanctioned amount shall be required to be submitted by the Exporter or his authorised agent.

The above endorsement and pre-receipting of the claim is not required to be made in respect of all provisional claims for drawback under Section 75, wherein the drawback rates are yet to be fixed by the Government. In such cases and in cases of pending drawback claims, wherein shipments were effected prior to 1-1-1973, the amount of drawback sanctioned will be intimated to the Exporter, who shall forward a pre-receipt for the amount. On receipt of this pre-receipt cheque will be issued to the Exporter.

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U.K.

Soft Drinks Statistics

Business Monitor PQ 232, containing statistics relating to U.K. sales of soft drinks in second quarter of 1974, has been issued by the Department of Industry Business Statistics office. Copies are obtainable on a subscription basis from H.M.S.O., P.O. Box 569, London, SE1 9 NH.

Sales of concentrated soft drinks were in total similar to those in the second quarter of 1973 while sales of unconcentrated soft drinks in the second quarter of 1974 were 3 per cent higher than in the corresponding period of 1973.

U. K. Sales of Soft Drinks—Million Gallons

	1973	1974
Concentrated	2nd Quarter	2nd Quarter
Squashes, Cordials	5.8	5.5
Comminuted	14.5	13.9
Other types	4.6	5.5
Total	24.9	24.9
Unconcentrated		
Carbonated	91.3	94.2
Other types	2.3	2.3
Total	93.6	96.5
Total Ready-to-drink Equivalent	218.1	221.0

U.S.A.

Water Resources

A comparative study on water resources to help developing countries cope with institutional policy barrier in developing national water resources has been published by the United Nations. The survey is based on the experiences of five countries namely Hungary, India, Israel, Mexico and Spain. It provides general ideas and new

concepts that might be relevant to national efforts towards improving water resources management. The study includes other national experiences on specific topics, such as the Algerian experience with planning and policy making in water development.

The Study entitled National Systems of Water Administration examines the economics and ecological implications of water resources in relation to the main sectors of a nation's economy and its natural resources as a whole. Other topics discussed are the programmatic potential and the planning capability of the national system of water administration; the role and status of the nation's water agencies and authorities as potential factor in facilitating or impending management in the country; the role of the local, regional, and private authorities in the administration of the nation's water system.

The improvement of the national system under each of these points is considered as the basic procedure to be followed in order to achieve the effectiveness of each national water development and administration scheme.

Prof. Albert Lepawsky of the Department of Political Science, University of California, Berkeley, coordinated the country studies and the preparation of the volume.

Over the last 10 years, developing country contributions have increased at about the same rate as those of the industrialized nations.

New Sweetener

The FDA have permitted the use of G.D. Searle and Co's sweetener, ASPARTAME, in free-flowing sugar substitutes for table use in package units not to exceed the sweetening equivalence of 2 tea spoonfuls of sugar; in sugar substitute tablets for sweetening hot beverages, including coffee and tea; in cold breakfast cereals; in chewing

gum; in dry bases for beverages, instant coffee and tea, gelatins, puddings, fillings and dairy product analogue toppings; and as a flavour enhancer in chewing gum.

Aspartame is the methyl ester of a synthetic dipeptide of two amino acids, L-aspartic acid and L-phenylalanine. It is about 180 times as sweet as sugar and is metabolized as a protein providing approximately 4 calories per gram. Because of its intense sweetness, the amount of ASPARTAME needed to sweeten food satisfactorily is so small that its caloric contribution is insignificant.

In the digestive tract, aspartame is hydrolyzed to L-aspartic acid and L-phenylalanine, the amounts of which entering the diet from the uses permitted would be nutritionally insignificant and too small to pose any risk of amino acid imbalance; this is also true for L-leucine, which can be added as a lubricant in the manufacture of tablets containing ASPARTAME, at a level not to exceed 3.9 per cent of the weight of the tablet.

Since persons with phenylketonuria, an inborn error in metabolism, must restrict their intake of L-phenylalanine, all finished foods containing ASPARTAME must be labelled with the warning statement, 'Phenylketonurics; contains Phenylalanine'.

The prolonged cooking temperatures such as those encountered in frying and baking can cause significant breakdown of ASPARTAME to diketopiperazine, with a consequent loss of sweetness. ASPARTAME is not permitted for such uses.

United Nations Development Programme

Technical aid programmes worth about \$ 83.5 million for 10 low-income countries, and authorization of four major projects costing \$ 32.3 million in Asia, West Africa, Egypt and Syria, were among the highlights of action taken by the Governing

Council of the United Nations Development Programme (UNDP) in New York from 15 January to 3 February 1975.

The Council authorized measures to help rehabilitate countries seriously affected by natural disasters, including aid to drought-stricken Somalia and additional assistance to earthquake-ravaged Pakistan.

Acting as the governing organ for the United Nations Fund for Population Activities (UNFPA), the 48-member Council approved the expenditure of up to \$80 million for demographic projects throughout the world in 1975, as well as large-scale projects or programmes of UNFPA aid in Colombia, Yemen, Algeria, Tunisia and Peru, at a total cost to the fund of about \$12.2 million.

The United Nations Development Programme, which supports the efforts for economic growth and social progress of 140 countries and territories, is financed in two ways. First, the developing countries themselves pay on an average more than half the costs of their UNDP-assisted projects. Second, almost every member of the United Nations and its associated Agencies makes a yearly voluntary contribution to the UNDP's central resources. Since 1959, these contributions have totalled \$3,236 million.

Based on commitments made or anticipated, the UNDP should receive a total of some \$400 million from 136 governments for its activities in 1975, an increase of about \$45 million (12.5 per cent) over the total for 1974. An additional \$10 million was pledged by six nations for special help to the least developed countries.

Increases from the major donor countries as a group came to 12 per cent. The largest individual increases were those of New Zealand (75 per cent), Norway (34 per cent), the Federal Republic of Germany (27 per cent), Australia (20 per

cent), Belgium (20 per cent), and Denmark (16 per cent).

Developing countries with *per capita* gross national products of over \$500 raised their contributions by 15.2 per cent and those with smaller *per capita* GNPs by 25 per cent. Major increases included Albania (5 per cent), Lebanon (34 per cent), Hungary (20 per cent), Romania (20 per cent), Zaire (20 per cent), Senegal (16 per cent), Ghana (15 per cent), and Pakistan (15 per cent). 66 countries raised their pledges over the 1974 level—35 of them by 15 per cent or more.

Since 1972, the Nordic countries have increased their annual share of total contributions from 21.8 per cent to an estimated 25.2 per cent to the Common Market countries (less Denmark) from 23.4 per cent to an estimated 26.3 per cent—and the donor countries of the Pacific Area (Japan, Australia, New Zealand and the Peoples Republic of China) from 4.1 per cent to 5.7 per cent.

Over the same period, the United States share of total contributions has fallen from 31.9 per cent to an estimated 24.9 per cent, and that of Canada from 6.7 per cent to an estimated 6.1 per cent. The proportional share of the Eastern European countries has remained at about 1.1 per cent.

WEST GERMANY

Anuga

Anuga is the 'World Market' for food. It is the world's biggest exhibition of fine foods and provisions. Products of nearly all countries, agricultural products, and a full range of technical equipment for catering and meal services, for the food industry trade and skilled trades, will be on display.

Financial aid will be available through the German Government for participating

countries to support in exhibiting their goods.

Anuga 1975 is scheduled for 13th to 18th September 1975 in Cologne, Federal Republic of Germany. For more details:

The Indo-German Chamber of Commerce
'Maithri', 19, Cathedral Road
Post Box No. 4905
Madras-600086.

AUSTRALIA

New Dehydrating Process

A new process for dehydrating pears and apples and retaining the high nutritional content and fresh fruit flavour and appearance of the natural fruit is being used by Blue Moon Fruit Co-operative Limited, Blackburn, Victoria, Australia 31302.

The fruit is peeled, cored and halved, placed into single layer trays and subjected to a short sulphur fumigation process which ensures there is no loss of natural colour. It then enters a dehydration tunnel, where it is dried in an atmosphere of controlled temperature and humidity for a period of 12-16 hours. After cooling, the fruit is hygienically stored in sealed polythene bags.

In this process the pears are dried to approximately 20-22 per cent moisture content.

When the pears are reconstituted by adding water the consumer gets 2.50 kilos (5 lb.) of fresh/preserved pears for every 0.50 kilos of dehydrated fruit.

The dehydrated pears contain vitamins A and C, Thiamin, Riboflavin and are a good source of calcium, with around 1355 calories per 0.50 kilos.

The pears can be consumed in their dehydrated form.

They also can be reconstituted to a fresh product by soaking overnight in water and

then, if preservation is required, by boiling for five minutes with or without sweetener.

Overnight soaking is not necessary if the pears are reconstituted by simmering for 30 minutes.

The reconstituted product can be kept fresh in a refrigerator while the dehydrated product will keep indefinitely in the kitchen cupboard.

Keeping Fruit Juices Fresh

A method of sterilising natural fruit juices without adding chemical preservatives has been developed by Beverage Custom Packers Pvt. Ltd., 11 Bryants Road, Dandenong Victoria 3175, Australia. The process keeps juices fresh for about three months. Juices produced under the process are orange, grapefruit, lemon and apple.

During sterilisation, they undergo a series of temperature ranges to kill all fermentation yeast cells. The process does not affect vitamin C content. The juices are vacuum sealed to preserve their natural goodness and refrigeration is not needed during storage or transport. They can be shipped as general unrefrigerated cargo without their freshness being affected. There are no pulp particles in the juices because they are homogenised during the sterilisation process.

The juices are available in 2 ltr (0.4 gal) and 4.5 ltr (1 gal) PVC containers. Orange and apple juices also are offered in 0.284 ltr (10 oz) glass bottles.

Gear for breweries and beverage producers

Bell Bryant Pvt. Ltd., 37 Herbert Street, St Leonards, New South Wales 2065, Australia, produce small soft drinks factories and fully automated equipment for largest breweries and beverage producers.

Machines have a range of capacities for the washing and filling of bottles up to a rate of 1,670 a minute.

The equipment is robust and most modern available in the world. It is made in Australia as a joint venture with a German company.

Equipment is capable of handling the complete range of cans, returnable bottles and non-returnable bottles. Apart from washing and filling machines, the company makes tunnel pasteurisers, conveyers, filtration equipment, crating and decrating machines and pelletising machines. Bottle washing machines handle all types and sizes of bottles, and the treatment cycle is engineered to ensure a clean bottle at all times.

All washers have a plastic bottle washer pocket, which eliminates damage to the bottles during the passage through the washer. An efficient label removal system can be provided on all machines. The range of bottle filling valves, giving a range of capacities dependent on bottle size, is as high as 1,670 bottles a minute. A pre-evaluation system provides a lower oxygen content in the bottles for products such as beer. It is also possible, by provision of additional components, for all fillers to handle 350 ml cans at a range of capacities up to 350 a minute. Beyond this point a range of can fillers is available with speeds up to 1,400 cans a minute.

A Paramix unit produces a range of carbonated products with accurate Brix control. The units are automatic and require no supervision beyond a periodic check of the Brix level.

The company specialises in the supply of complete bottling lines, and also offers decrating, pelletising and de-pelletising equipment, and bottle and case conveyers to connect all machines.

Ice Cube Machine

Icemaking machines are manufactured by a division of Robin-built Pty. Ltd., Hawthorn Victoria 3122, Australia, for hospitals, hotels, motels, restaurants, clubs, caterers, garages, construction camps and caravan parks.

The MK. IV commercial icemaker, sold under the 'Goldfinger' trade name, is self-contained with a minimum 24-hour production rate of 102 kg (225 lb.).

Fitted with finger-type evaporators, the unit combines a maximum freezing area with minimum water wastage.

Output is completely automatic and various sized cubes can be obtained by adjusting the controls.

The unit is fitted with an ice storage cabinet capable of holding about 700, 1.5 kg (8 lb.) bags of ice, while the manufacturing section can hold a further 130 kg (300 lb.) of bulk ice.

The cabinet and head are designed to give easy access for service.

The unit has a vigorous water recirculation system which helps reduce algae formation.

A large internal reservoir pre-cools water, thereby ensuring constant production rates.

A stainless steel water tank is provided for use where there is no mains supply.

The unit is 182.8 cm (72 in.) high, 198.1 cm (78 in.) wide and 91.4 cm (36 in.) deep.

It has been commended by the organisers of the Prince Philip Prize for Australian design.

The company also makes a smaller version, the MK. II, which incorporates many of the 'Goldfinger's' features in a more compact cabinet.

Storage capacity is approximately 50 kg (110 lb.) of ice, although production even under ambient conditions up to 32 degrees C (90 deg. F) is still 342 kg (225 lb.).

The cabinet is 119.3 cm (47 in.) high, 9 cm (35 in.) wide and 64.7 cm (25½ in.) deep.

The standard cabinet finish is Marvite but stainless steel or hammertone are alternatives.

Both units require no elaborate installation procedures—only water and electricity are needed.

Blood Grouping gives more Lambs

Australian graziers, Mrs Marjory Lewis and her husband, Mr Norman Lewis, of Western Australia, have discovered that ewes with blood type AA have less lambing difficulties than ewes from the same flock with other blood types. In addition, the lambs from type AA ewes said to have a much lower mortality rate.

Mrs Lewis sought the advice of Dr John Heston of the Commonwealth Scientific and Industrial Research Organization (CSIRO), to analyse the sheep by their blood groups. It was found that AA group ewes lambed the best, ABs less well and BBs still less.

Mrs Lewis formed a breeding flock based on the number of lambs raised. Before an ewe was admitted to the flock she was to have had and raised at least three lambs. Some of the ewes in this first flock had had one or more lambs.

In this flock, 21 per cent of the ewes had the AA blood group, 46 per cent were ABs and 33 per cent were BBs. This was described as 'an unusual distribution in favour of the A factor'.

The lambing in the special flock reached 91 per cent, while the lambing in the general flock was only 84 per cent.

Instant Citrus Drink

A flavoursome new citrus drink made from normally discarded peel has been formulated at the CSIRO Division of

Food Research, North Ryde, N. S. W., 2113.

The drink is prepared as a powder which mixes readily with water to produce a lemon or orange beverage with full natural flavour and with a high vitamin C content.

The Australian citrus industry has quite a problem disposing of the peels left over from making fruit juices. Only small quantities are used in making candied peel. Some is fed to stock and some is used as orchard compost, but most is simply dumped.

The citrus peel contains much of value. Three-quarters of the total vitamin C content of the fruit is located in the peel, as are most of the essential aromatic flavouring oils and natural colouring pigments. Natural antioxidants and cloud stabilisers are also present.

The new drink provides a way of utilising peel that would otherwise go to waste. The peel cups left over from the juicing machine provide the raw material. The pithy part contains bitter principles. This is shaved away using machinery available for the job. The shaved cups are then placed in a vacuum steam blancher where the peels are steam heated for about three minutes.

A hammer mill followed by a colloid mill breaks the peel down to a smooth paste which is drum dried, with or without the addition of sugar or citrus juice concentrates.

The final drink powder keeps well. Two teaspoonfuls dissolved in a glass of water produce an appealing, refreshing drink.

ROME

FAO Agricultural Commodity Market 1974

Estimates indicate that the expansion of world meat production virtually ended in

1973. Meat output actually declined. Poultry though continued to rise the rate of increase in 1973 was one of the lowest recorded in the earlier two decades.

Herd expansion, delayed marketings for better prices and shifts to less intensive fattening methods, sharply rising prices of feed grains and protein feedstuffs were the main reasons why beef production failed to expand. In the pig-meat sector, producers were faced with an increasingly severe cost-price squeeze which led to repeated downward adjustments in their production plans. Similar pressures affected poultry meat production.

Cattle prices reached a record high level during the year. As consumer resistance to ever-rising meat prices hardened, cattle markets weakened and prices started to fall. In the EEC, producer prices declined in February to such an extent that Belgium, France and Italy suspended imports of chilled and fresh beef from third countries and the Community introduced licensing for imports of live slaughter cattle and frozen beef. Pig-meat and poultry prices in 1973 rose sharply. During 1974, pig prices began to weaken in North America and western Europe, though in most countries remaining higher than those of a year earlier. For poultry prices, trend remained generally upward.

Production outlook for 1974 was not encouraging except for beef. Uncertain outlook for demand in view of the slow-down in economic growth and rising production costs continued to discourage expansion in the pig and poultry sectors.

Cocoa bean prices, due to difficult supply situation and low world stocks, have again reached a new record. Following the previous high of 70 U.S. cents per pound in July 1973, prices later steadied around 50-55 cents early in 1974. Later prices began rising steeply, as pressure on supplies

became acute, prices rose to 80-90 U.S. cents an increase of nearly 125 per cent since March 1973.

World production in 1973-74 was estimated at 1,410,000 metric tons. The revised figure for 1972-73 was 1,418,000 tons and for 1971-72 was 1,588,000 metric tons. The 1973-74 figure represented a downward revision of the figure of 1,450,000 metric tons. The decline in 1973-74 production was largely attributed to unfavourable weather conditions, prolonged drought which adversely affected certain West-African producing countries. World grindings in 1974 were forecast at 1,504,000 metric tons, a decrease of 40,000 tons from the 1973 estimate of 1,544,000 tons. The decrease was attributed to the sharp rise in cocoa bean prices.

World market prices for sugar increased dramatically in 1974, reaching a peak of 26.25 cents per lb. in New York (In the London market the c.i.f. price reached £274 per long ton). They remained mostly above the 20-cent level, and over the first quarter of the year they averaged 19.2 cents per lb. ten times as high as in the surplus years of 1965-1968. The rise in prices has been helped by considerable speculation in the future markets, where prices have been even more volatile. It reflects the severe shortage of supplies and the continued demand by countries of the Near East. The shortage of exportable supplies appears to be particularly acute for refined sugar, because of the curtailment of EEC exports to third countries as well as because of the continued absence of supplies from the U.S.S.R.

There has been no fundamental change in the supply-demand outlook for the 1973-74 season as a whole, although there have been some reductions in various estimates of world production. It is expected that carry over stocks will be extremely low and the prices will remain unstable and will become very sensitive to 1974-75 crops.

BELGIUM

shrimps

The following types of shrimps are covered under the Brussels Tariff Nomenclature heading No. 03.03: Shrimps in shell (live or dead), chilled, frozen, salted, brine or dried. It includes shrimps in their shells simply boiled in water (whether or not small quantities of boric acid or other provisional preserving agents have been added). This excludes shrimps prepared or preserved by processing not provided for in the present heading (e.g., shelled shrimps, simply boiled in water), heading No. 16.05.

Belgian/Luxembourg requirements of BTN No. 03.03 of shrimp rose substantially between 1971 and 1972 by 616 tonnes (from 872 to 1488 tonnes) but declined by 16 tonnes between 1972 and 1973. Imports during the first six months of 1974 reached 628 tonnes. During the first six months of 1974, 50 per cent of the local needs were supplied by the Netherlands, 1.5 per cent by France, 8.8 per cent by U.S.A., 8.6 per cent by Indonesia, 4.9 per cent by China, 3.8 per cent by Denmark, 1.3 per cent by Hong Kong and 0.7 per cent by Ivory Coast. India's share was a mere 0.2 per cent or 1.5 tonnes worth BF 376,000 (one Rupee=Approx. BF 5.00). It will be seen from these figures that India's prices were the least competitive during 1974.

The imports of shelled shrimps BTN No. 16.05 have shown a substantial increase over the past four years. They increased from 1714 tonnes to 1794 tonnes between 1971 and 1972, by a further 410 tonnes between 1972 and 1973 and during the first six months of 1974 had reached 1,140 tonnes. It is estimated that the increase for 1974 as a whole will be about 200 tonnes over 1973. During the half-year 1974, 75.8 per cent of the total requirements were

supplied by the Netherlands, Malaysia, West Germany, U.K., Denmark, U.S.A. and Indonesia. India's share of the market which was 3.9 per cent in 1971, fell to 2.9 per cent in 1972, rose slightly to 3.0 per cent in 1973 and was 3.8 per cent during the six months of 1974.

AUSTRIA

UNIDO Meeting on Marketing

Marketing was described as a vital factor to ensure the attainment of socio-economic targets of industrial development at a meeting in Vienna from 2-7 December 1974 attended by government officials, industrialists and experts from twenty developing and least developed countries.

The statement was made on behalf of Ibrahim Helmi Abdel Rahman, Executive Director of the United Nations Industrial Development Organization (UNIDO), by Edward Napoliello, Director of UNIDO's Industrial Services and Institutions Division.

The meeting was arranged by UNIDO to examine marketing management and strategy for the developing world and national participants were from Colombia, Cyprus, Egypt, Ethiopia, Gambia, Ghana, Hungary, India, Iraq, Jamaica, Jordan, Lebanon, Libya, Mauritania, Mexico, Panama, Romania, Senegal, Somalia and the United Republic of Tanzania. Representatives of 18 United Nations agencies, international institutions, associations, federations and universities also attended.

Emphasis was placed on the importance of regional co-operation in marketing, research, distribution and promotion. Another essential need was to create or develop national or sub-regional marketing centres aimed at improving and co-ordinating policies, methods, systems and structures of industrialising countries.

In the light of actual and foreseeable conditions of development of the third

world and with a view to achieving the objectives of a better quality of life, economic independence and progress, UNIDO should be encouraged to develop its programme of technical assistance. Such assistance would help to improve government and industrial levels of expertise, inducing the creation and development of national and sub-regional institutions, policies, methods and systems.

Industrialisation and Domestic Marketing

UNIDO has embarked on a programme of industrialisation and domestic marketing by examining the problems of domestic market in developing countries. UNIDO offers advice, consulting service on domestic distribution system, communication and promotional strategies, market and consumer information system, product planning, product launching techniques, merchandising methods, marketing and channels network organisation, product and product lines profitability, trade marks, labels, marketing policies and management.

UNIDO offers specific short or long term assignments for the development of domestic marketing system on pricing, distribution, promotion, product planning, merchandising, purchasing, research, market and consumer studies.

UNIDO's Industrial Management and Consulting Service Section organised an expert group meeting on marketing management and strategy for developing world at Vienna from 2-7 December 1974.

A Seminar on Industrial Development through domestic marketing expansion will be organised during 1976.

JAPAN

United Nations University

The Prime Minister of Japan, Mr Miki Takeo, inaugurated the founding of the

United Nations University when he addressed the fourth session of the University Council in Tokyo on 20th January. This was the first session of the Council since the opening of the University's temporary headquarters on 2nd December 1974.

The Council session was also attended by the Rector-Designate of the University, Dr James M. Hester, who is currently President of New York University. Dr Hester presented to the Council a series of recommendations to implement the University's mandate.

The 24-member University Council was appointed jointly by the United Nations Secretary-General, and the Director-General of the United Nations Educational, Scientific and Cultural Organisation (UNESCO). The Secretary-General, the Director-General of UNESCO, the Executive Director of the United Nations Institute for Training and Research (UNTTAR) and the Rector are *ex-officio* members of the council.

Mr C. V. Narasimhan, United Nations Under-Secretary-General for Inter-Agency Affairs, represented the Secretary-General at the University's inauguration and at the fourth session of the Council.

Dr Hester identified six most-often-mentioned areas of global concern for consideration by the Council when it discussed programme priority. These are:

(a) Management of Natural Resources, (b) Environmental Engineering, (c) World Hunger, (d) International Relations, (e) Development, and (f) Human Rights.

Dr Hester hopes that the University will be fully operational by December 1976. The University will be financed entirely by voluntary contributions from governments and non-governmental sources.

Help to Export Industries

A gift of \$ 125,000 has been made by the Government of Japan to the United

INDIAN FOOD PACKER

Nations Industrial Development Organization (UNIDO) to be used in building up the export potential of countries in South-East Asia.

The money will be used to finance a project aimed at establishing and developing export-oriented industries in support of the priority given by the Japanese Government to international industrial co-operation.

This is the third voluntary contribution made by Japan for special UNIDO programmes on behalf of developing countries.

In addition to cash contributions, Japan has offered facilities during the last three years for a number of UNIDO training programmes to help developing countries.

DENMARK

High-speed Automatic Nitrogen Determination

Faster processing and lower labour costs are two advantages provided by the Kjeld-Foss Automatic system of nitrogen determination developed by Foss Electric.

Instead of the hours needed by normal methods to determine nitrogen content by the standard Kjeldahl method, the Kjeld-Foss Automatic requires only 12 minutes and the desk-sized unit can receive a new sample every third minute. Digestion, cooling, distillation and titration are accelerated under carefully controlled conditions and the process ends in an automatic digital read-out on a control panel. Overall costs per sample are low and highly qualified personnel are not required for operating the equipment.

PHILIPPINES

World Packaging Congress

The Fourth Congress of WPO will be held in Manila, from 3rd to 7th November

1975. The theme is 'Packaging in a Changing Economy'.

The Packaging Institute of the Philippines, who are the organisers of the Congress, has sent experts around the world to seek the most qualified speakers and to obtain ideas on the subjects that have the greatest interest to packaging.

An important facility provided by the organisers is the fixed forward rates for hotel accommodation—US \$ 20 for single rooms and US \$ 25 for doubles for 200 rooms for overseas participants on a first-come first-serve basis.

World Star awards will be presented at the 4th World Packaging Congress. The selection for 'World Star' will take place on 6th May 1975 in London. Awards will recognise outstanding packages which have won a Continental Award either an 'Asiastar', 'Eurostar' or 'North Star' in competitions organised by the Asian Packaging Federation, the European Packaging Federation or the North American Packaging Federation respectively, in the years 1972, 1973 or 1974.

Information regarding the Congress and Registration Forms can be obtained from:

The Fourth World Packaging Congress
Packaging Institute of the Philippines
MCC P.O. Box 1058
Makati, Rizal
Philippines.

EGYPT

Suez Canal

Egypt is to receive help from the United Nations Development Programme (UNDP) in developing a regional framework for the development of the Suez Canal zone.

As part of a \$9.5 million project approved by the UNDP Governing Council in New York, UNDP will also assist the Government of Egypt in the preparation of 20-

year master plans for the development of the zone's most populous areas of Ismalia, Port Said and Suez.

Egyptian Government expects that the clearing the Suez Canal will be completed in early 1975 and hopes that normal life will be resumed in the Suez Canal region in the near future. UNDP is to contribute \$4.6 million and Egypt \$4.9 million towards the two-year project.

KUWAIT

Poultry Farm

The Government has approved the setting up of a major poultry farm with a capacity of 1.2 million fowls annually.

A plant to manufacture 'Trauby Juice' (a kind of soft drink) will be established with a capacity of 400 crates per hour in a single shift of 8 hours daily.

It has been decided to set up a cheese factory with a capacity of 75 tons with a capital investment of K.D. 20,000. There are six cheese plants in operation.

A new fishing company has been set up by the United Fisheries Company of Kuwait and the Malagasy Government. It has 13 fishing vessels and a fish freezing plant.

Developments

The Cooperative Societies Union in Kuwait (controlling about 20 supermarkets in the country) has started importing secondary food items directly, thereby eliminating the local agent in the private sector.

The items initially covered are cheese, oils, cream, jam, canned food, chicken (frozen), milk powder, etc. This move will cut into the profits of leading exporters in the private sector.

60,000 heads of cattle were consumed in Kuwait in October 1974. This includes

34,000 heads slaughtered locally, and the balance imported from Sudan and Turkey. It is learnt that the average import of meat into the country each day totalled 825 heads.

During the month of Ramadhan, consumption of meat had hit a new high when the local butcheries dispensed almost 3,000 heads of cattle each day. This quantity did not include chicken, which was being sold at a premium price of 750 Fils per kilo. Following the month of fasting the price of this item has fallen considerably. The present price stands at about 500 Fils per kilo for fresh fowl and between 400-425 Fils per kilo for frozen fowl. Fish is available at a reasonable price of 400 Fils per kilo for most varieties and 500 Fils for certain expensive types.

The total quantity of sugar consumed in the State of Kuwait from October 1973 through April 1974 was around 17,500 tons. 2,500 tons per month or 80 tons per day are needed in Kuwait. Considering that Kuwait's population is a little over one million and the *per capita* consumption of sugar is 30 Kilogrammes per annum, a total of 30,000 tons of sugar will need to be imported every year. 20,000 tons of Polish sugar will shortly reach Kuwait, thus supplementing the present imports from French sources.

The Kuwait Supply Company has placed an order for 20,000 tons of rice from the U.S.A. Another order for a similar quantity of 20,000 tons has been placed for rice from Thailand. The U.S. rice will be retailed through the co-operatives at a subsidised rate of 175 Fils per kilo. The Thai rice is likely to be sold at the rate of 145 Fils a kilo.

A leading Kuwaiti importing company has purchased through negotiation 35,000 tons of Indian Basmati rice. A part of this quantity will be sold in Kuwait and the rest will be distributed in the other

of States and Iran. To popularise an Basmati rice, this company has launched a major publicity drive through media, including T.V., cinema and advertisements in the dailies.

SULTANATE OF OMAN

Drinks

The Ministry of Development has announced that from 15th September 1974 the importation into Oman of Cola, orangeade and Lemonade is prohibited.

The ban does not apply to concentrated orange Squash, Lemon Squash or goods presently in transit to Oman.

QATAR

Pro-forma Invoices

The Director of the State Purchases Department of Qatar, Ministry of Finance and Petroleum Affairs, has stipulated that from 1 January 1975, pro-forma invoices submitted to the Government must conform with the following requirements:

The pro-forma invoice must be original. It must be stamped and signed by the supplying company/exporter. The exporting company's pro-forma invoice should have the same serial numbers of the items shown in the Government order sheet. The pro-forma invoice must indicate the expiry period and validity of the quota.

LIBYA

Industrial Developments

Libya's expenditure on industrial development since the Revolution of 1st September 1969 exceeds by 17 times what was spent on industry in six years before the Revolution. In 1970-71, over 20 million

dinars which equals 10.25 per cent of the total development fund of 200 million dinars were spent on industrial sector.

In 1971-72, 37 million dinars were spent which equalled 12.3 per cent of the total development fund which amounted to over 313 million dinars.

In 1972-73, over 68 million dinars were spent on industrial development equalling 15.4 per cent of the whole development fund of that year which aggregated nearly 443 million dinars.

In 1973, 262 million dinars have been allotted for industrial development in the framework of the Three-Year Development Plan, namely, from 1973 to 1975.

The Ministry of Agriculture has signed a contract worth 370,000 dinars for constructing two cow breeding stations in the Misratha Governorate.

During the month of Ramadhan, Libya has consumed a total of nearly 700 tons of beef imported from Hungary, Romania, Sudan and Kenya, and mutton from Hungary.

According to statistical statement issued by the National Livestock and Meat Company, 71,000 heads of sheep were imported from East European countries and 800 heads from France. The company sources estimated that the *per capita* consumption of meat has increased by about 70 per cent as compared with the corresponding period of last year.

The General Fishing Corporation announced that the total output of fish amounted to 193,593 kg.

Imports

The total imports of the month of January 1974 amounted to 43,593,000 dinars as against 30,313,000 dinars for the corresponding month in 1973, indicating an increase of 13,280,000 dinars. Of this, food and beverages alone accounted for an increase of 9,525,000 dinars.

The National Cattle and Meat Company has imported 25,000 heads of live sheep from Bulgaria and Hungary during the last week of August. It also imported a total of 500 cows from France in addition to 450 tons of mutton and beef. An official delegation of the company is to visit some East European countries for contracting importation of new quantities of sheep and meat. A French company has obtained a contract of 3,250,000 dinars for supply of 5,000 heads of cattle.

Preparations are underway for the construction of a new Sardine Factory at Benghazi. It will have a capacity of 15 tons of sardines a day. A contract has been signed in Homs for the installation of poultry plant to produce 70,000 eggs a week as also 60 qtls of honey.

Indian tea has arrived in the Benghazi market through National Supplies Corporation. It has become quite popular in super markets in Tripoli. With promotion schemes Indian tea has rapidly become popular in departmental stores and retailers.

An order for 50 tons of Basmati rice is placed by a Libyan firm in Benghazi through National Supplies Corporation. As a result of the resumption of trade between Nigeria and Iceland and Norway import licences to 2,500 businessmen have been issued to import stockfish in Nigeria.

IRAQ

Five-Year Plan (1975-79)

The Directorate of Livestock in the Ministry of Agriculture and Agrarian Reforms is planning to build eight stock breeding centres in the course of next five-year plan.

The Fisheries State Company has appropriated ID. 54,753,000 in the five-year Development Plan for expanding its projects. The company is planning to build

a plant for the production of fish powder to be used as animal feed, another plant for preparation of shrimps for marketing and building of a marine school at a cost of ID. 1,551,000 for supplying qualified seamen for the company's vessels.

A delegation of the State Organisation of Food Industries visited a number of European countries and signed contracts for developing the aerated beverages industry and the sugar industry in Iraq.

'Gepexport' of Hungary will supply Iraq with machinery and grape processing equipment and will erect a 100-ton-a-day capacity works near Mosul.

IRAN

Manpower Plan

A three-year crash programme to provide booming economy with thousands of new managers, trainers and technical instructors has been agreed upon between the Government of Iran and the International Labour Organisation (ILO).

This major programme which will cost over \$ 10 million is being financed by Iran with a contribution by the United Nations Development Programme (UNDP). It was worked out after an exchange of views between Mr Amir-Abbas Hoveyda, Prime Minister; Mr A. M. Majidi, Minister of State in charge of the Plan and Budget Organisation; Mr A. G. Moini, Minister of Labour and Social Affairs and Mr Francis Blanchard, Director-General of the International Labour Office.

The problem will be tackled by training 1,800 instructors, trainers and managers during the next three years at the ILO's International Center for Advanced Technical and Vocational Training in Turin. These instructors, trainers and training managers will then play their part in producing the 10,000 additional vocational

training instructors Iran needs for its accelerated development plan 1975-1978.

Iran will create a national training institute equipped with modern methods of training including a modular approach tailor-made for Iran's needs and conditions. The institute will train instructors, training officers and managers of vocational training centres for urban and rural activities.

ZAMBIA

Ban on Imported Foodstuffs

No import will be issued for the following commodities to be imported into Zambia.

SITC

Description

- (1) 01330 Meat or fish extracts and juices
- (2) 01340 Sausages
- (3) 01382 Meat pastes
- (4) 01383 Tinned bacon and ham
- (5) 01389 Meat preparations, other
- (6) 03202 Crustaceans and molluscs
- (7) 03201 Caviar and anchovies
- (8) 03208 Fish pastes
- (9) 03209 Fish preparations, other
- (10) 05201 Tropical fruits and nuts (dehydrated)
- (11) 05202 Dried figs and prunes
- (12) 05206 Dried citrus fruits
- (13) 05352 Blackcurrant juice
- (14) 05353 Grapefruit juice
- (15) 05392 Prepared or preserved mangoes
- (16) 05393 Prepared or preserved pineapples
- (17) 05294 Preserved citrus fruits
- (18) 05462 Vegetables in temporary preservatives
- (19) 05469 Frozen vegetables
- (20) 05510 Dried and dehydrated vegetables
- (21) 05399 Preserved fruits and nuts, other

TANZANIA

Trade Gap

The BANK OF TANZANIA has issued a grim warning on the state of the country's economy. It has predicted a big balance-of-payments deficit in 1975, which is likely to continue beyond 1976. The world wide inflation and increase in oil price have caused a sudden turn around from a surplus balance-of-payments in 1973 of about £15 million to a deficit in 1974.

The shortfall, also due to drought, will mean a hike in imports at higher international prices which is likely to have a great impact on the balance-of-payments. The poor performance of traditional exports such as cotton, coffee, cashewnut and sisal in spite of buoyant world prices was the main weakness. Tanzania could no longer depend on traditional exports to pay for its fuel and development needs and must investigate new areas of production such as mining and manufacturing.

The Bank recommended maximum foreign assistance from traditional sources, viz. the IMF, the IBRD and the Special Arab Fund for Africa, but was of the view that the total funds available to Tanzania through these sources fell far short of the expected deficits during the next two years. This prompted a complaint that the industrialised countries and the Arab oil producers had shown scant appreciation of the difficulties facing countries like Tanzania, which had no 'luxury margin' to fall back upon and no alternative sources of fuel. International reaction to the combined food and oil crisis in the Third World countries was also disappointing. Trade figures in the report show that China has replaced Britain as Tanzania's major source of imports, although Britain continues to be Tanzania's export market.

KENYA

Maize Industry

Kenya with an International Corporation will establish a milling plant for maize, which is expected to bring in an income of \$5 million a year from domestic and foreign sales by 1980.

Maize has recently been introduced to Kenya. It has become a very successful crop.

At the request of the Government, funds were made available by the United Nations Development Programme (UNDP) for a study of possibilities, processing methods, the most promising lines to follow and the scale of investment required. Taking into consideration the expert's technological experience combined with marketing knowledge, investments and cost effectiveness, an UNIDO expert went to Kenya in 1969.

The expert advised establishing a wet corn milling factory. His report served as the basis for negotiations for a corn-processing plant at Eldoret, 51 per cent to be owned by a European company, 40 per cent by the national Industrial and Commercial Development Corporation and 9 per cent by the Societe Internationale financiere pour les investissements et le developpement en Afrique (SIFIDA).

He considered that the factory would use up some of the additional corn, reduce imports of oil seeds and protein-rich components for animal feed, enable the country to export processed products and influence the expansion of industries allied to the processing industry.

The plant employing 100 Kenyans will produce starch, glucose syrup, maize oil and animal feeds. The animal feeds will be sold in the domestic market and half of the maize oil and part of the starch and syrup will be exported. It is estimated that

after five years of operations annual sales will amount to \$5 million.

At full capacity, the plant will use about 15,000 tons or 150,000 bags of maize a year. This would represent an income of nearly \$800,000 for the farmers. Production is expected to begin this year.

The Centre, which is under the Ministry of Commerce and Industry, was set up at the end of 1970 as a joint project of the Government of Kenya and UNDP to enable the Government to play a larger part in accelerating Kenya's industrial development.

Developments

All import licences are being verified before payment for the goods or the opening of a letter of credit is authorised by the banks. The move follows reports of forged import licences and other malpractices. The verification has created new problems and higher costs for importers as some of the consignments have landed at Mombasa port or Nairobi airport. According to a circular issued by the Central Bank, banks have been asked to send the import licences for verification to the Central Bank before making remittance for the import or even opening a letter of credit for them.

K. Shs. 58,800,000 loan agreement was signed in Nairobi on November 28, between Kenya and West German Governments, for the extension of Chemilil Sugar Company and for new equipment to help step up sugar production. The assistance was supplementary to a previous one by the West German Government to the company and brings the total German aid to K. Shs. 148,400,000.

An international laboratory for research into animal diseases is to be built in Kenya at a cost of 105 million shillings.

SRI LANKA

Sugar

The high cost of sugar in the world market compelled the Government to reduce the quantum of sugar issued on ration from 1 lb. to $\frac{1}{4}$ lb. per person per month from October 1, 1974. Price of off-ration sugar was earlier raised to Rs 7.50 a lb. which is now issued to specified categories of institutions such as tourist hotels, restaurants, rest houses, hospitals, railway restaurants and stations.

To overcome the shortage in local production of sugar, the People's Bank has formulated a scheme to help the small-scale sugarcane industries. The Bank will give loan facilities upto a maximum of Rs 50,000 for establishment of new processing units.

Faced with acute shortage of sugar, Sri Lanka approached several countries for this item. Sri Lanka purchased 10,000 tons of sugar from India in April 1974 at £215 a ton c.i.f. Colombo and another 10,000

tons in August 1974 at £289 per ton. Sri Lanka requested Singapore also for a supply of 6,000 tons of sugar in November 1974.

Sri Lanka contacted a dairy in Bulgaria for the purchase of 600,000 tons of brown sugar at about 300 pounds Sterling per ton. London daily prices during signing of the contract was 300 pounds Sterling a ton. During the current year so far Sri Lanka has received 3 consignments of sugar, each of 10,000 tons.

Sri Lanka expects to purchase sugar from Mauritius.

The Central Bank of Ceylon revised exchange rates of foreign currency in relation to the Ceylon Rupee from October 1974. Rates of certain important foreign currencies are given below:

Australia	Dollar	8.7636
Canada	„	6.7836
Japan	Yen	0.124
U.K.	Pound	15.6000
U.S.A.	Dollar	6.6881

For all your requirements of dehydrated and canned fruits and vegetables

Write to: **M/s. DEPRO FOODS LTD.**

20th Mile, G. T. Road, Rai, Near Sonapat, Haryana

Ring Factory 89560 Sonapat Ex. Delhi 72449

Trade Marks

(Trade Marks accepted by the Trade Marks Registry)

Sl. No.	Name and address	No. and Date of the Trade Marks Journal publishing the Trade Mark	Official No. of Trade Mark	Date	Products	Trade Mark
M/s. 1.	The Tata Oil Mills Co. Ltd., Bombay House 24 Horni Mills Street, Fort, Bombay 40023	615/16-1-1975	294,401B	23-2-1974	Canned and bottled fruits, canned and bottled vegetables, dehydrated fruits and vegetables, pickles, dairy products for food, jellies for food and jams, soups and soup powder, marmalades, peeled tomatoes, tomato purées and tomato pastes	Four Seasons (Class 29)
2.	Ramesh Chemical Industries, Chuchava Para Near Budhwar Bazar, Bilaspur, Madhya Pradesh	616/1-2-1975	289,503	20-1-1973	Food products included in Class 30 containing honey, glucose, sucrose and preservatives	Honey (Class 30)
3.	Windsor Foods Private Limited, Makarpura Baroda 390 009	do	289,883	2-6-1973	Syrups for making beverages and beverages (non-alcoholic)	Tookapi (Class 32)
4.	Pfizer Inc. 11 Bartlett Street, Brooklyn, New York	do	291,602B	25-10-1973	Non-alcoholic drinks, preparations for making beverages, mineral and aerated waters	Pfizer (Class 32)
5.	Bangash Fruit Processing Industries, No. 28 Mandawadi Road, Mysore 570 008	617/16-2-1975	295,205B	27-3-1974	Fruit juice beverages (non-alcoholic) and fruit juices	Jusap (Class 32)

Government Notifications

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- Central Fruit Products Advisory Committee
 - Amendment regarding Sanitary Cans
 - Trade with Pakistan
 - Companies (Amendment) Act, 1974
 - Import of goods as personal baggage under baggage rules
-

Central Fruit Products Advisory Committee

In pursuance of the sub-clause of section 3 of the Fruit Products Order, 1955, the Central Government hereby constitutes, for a period of two years with effect from 16-7-73, the Central Fruit Products Advisory Committee consisting of the following members, namely:

Chairman

1. Shri G. C. N. Chahal, Joint Secretary, Department of Food, Ministry of Agriculture.

Vice-Chairman

2. Dr P. K. Kymal, Executive Director, Food and Nutrition Board, Department of Food, Ministry of Agriculture.

Members

- | | |
|---|--|
| 3. Shri P. K. Datt (M/s. Sri Kissen Dutt and Co., Calcutta), President, Fruit Products Manufacturers' Association, 8/3, Vidyasagore Street, Calcutta-9. | Representative of synthetic syrup, vinegar, murabba, chutney and pickles manufacturers. |
| 4. Shri V. B. Oberoi (Editor, Indian Food Packer), Messrs Kissan Products Ltd., P.B. No. 1676, Old Madras Road, Bangalore-560016. | Representative of manufacturers of canned fruits, vegetables, jams, jellies, marmalades and tomato products. |
| 5. Shri Thomas, M/s. Malabar Fruit Products Ltd., Adapay, P.O. Bharananganam, Kottayam (Kerala). | Representative of manufacturers of canned fruits, vegetables, jams, jellies, marmalades and tomato products. |
| 6. Shri N. P. Bhargava, M/s. Midland Fruit and Vegetable Products, P.O. Okhla Industrial Estate, Okhla, New Delhi-110020. | Representative of manufacturers of canned fruits, vegetables, jams, jellies, marmalades and tomato products. |
| 7. Shri B. N. Sharma (Secretary, U.P. Fruit Manufacturers' Association), U.P. Chemical and Fruit Products Ltd., P.O. Izatnagar, Bareilly, U.P. | Representative of small scale manufacturers of murabba, chutney and pickles. |

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| 8. Shri Y. K. Kapoor (Secretary, All India Food Preservers' Association), Northland Industries, 2154 Rajguru Road, New Delhi-110055. | Representative of small scale manufacturers of canned fruits, vegetables, jams, jellies and marmalades. |
| 9. Shri P. H. Bhatt, Kaira District Co-operative Milk Producers' Union Ltd., Anand, Gujarat. | Person possessing suitable technical qualifications for the manufacture of fruit products. |
| 10. Dr Anand G. Naik-Karade, Suman Food Consultants, D 15, Defence Colony, New Delhi. | Person possessing suitable technical qualifications for manufacture of fruit products. |
| 11. Shri S. Z. Varcie (Vice-President, Processed Foods Export Promotion Council), The Tata Oil Mills Co., Ltd., Elaiya Mudali Street, Madras-600081. | Representative of exporters of fruit and vegetable products. |
| 12. Shri L. C. Stokes, 'Premal', Kotgarh, P.O. Thandur, Simla Hills. | Representative of fruit and vegetable growers. |
| 13. Shri Vishwanathan, Chairman, Orange Growers' Cooperative Society Limited, Gonicoppal, Coorg. | Representative of fruit and vegetable growers. |
| 14. Dr B. L. Anala, Director, Central Food Technological Research Institute, V. V. Mohalla, Mysore-570013. | Representative of Central Food Technological Research Institute, Mysore. |
| 15. Shri Daljit Singh, Director (Horticulture), Department of Agriculture, Krishi Bhavan, New Delhi-110001. | Representative of Department of Agriculture. |
| 16. Shri D. S. Chaddha, Secretary, Central Committee for Food Standards, Directorate General of Health and Family Planning, Nirman Bhavan, New Delhi-110001. | Representative of Ministry of Health. |
| 17. Shri Daya Nand, Director (Fruit and Vegetable Preservation), Department of Food, Ministry of Agriculture, New Delhi. | Member-Secretary. |

Editor:

- Sl. No. 12 Shri L. C. Stokes—Expired on 12th September, 1973, IFP Vol. XXVII, No. 4, July-August 1973.
- Sl. No. 13 Shri Daljit Singh—Expired on 13th August, 1974, IFP Vol. XXVIII, No. 4, July-August 1974.

Amendment regarding Sanitary Cans
The following Public Notice No. Draw-
back/PN-41/74 dated the 1st October
has been issued by the Government
of India in the Ministry of Finance (De-
partment of Revenue and Insurance):

Under rule 4 of the Customs and
Excise Duties Drawback Rules
(Notification No. 52/F. No. 602/2/70-
published in the Gazette of India
Extraordinary dated the 25th August 1971),
the Central Government hereby makes the
following amendments in the Table pub-
lished in the Public Notice No. Drawback/
PN-41/74 dated the 15th October 1971:

Under Serial No. 3810 and the entries
therein, the following shall be
inserted:

72 dated the 11th February 1972 prohi-
biting the import and export of all goods
directly into or from any port or place in
India, from or to any port or place in
Pakistan.

2. It has been decided that unless other-
wise specified, the trade with Pakistan
will be conducted on Government to
Government basis or through Government
controlled Trade Corporations of the two
countries, on the basis of free convertible
currency in accordance with the foreign
exchange regulations in force from time
to time.

Companies (Amendment) Act, 1974

The Companies (Amendment) Act, 1974,
has come into force with effect from
February 1, 1975.

Sl. No.	Description of goods	Rate of drawback
10	Sanitary cans, double cans (excluding jams, curries) when exported in sanitary form or otherwise or when used as containers for the export of— (1) fish and fish products, (2) fruit and vegetable products, and (3) condensed milk.	(a) Whichever of the duty if any paid under item 46 of the First Schedule of Central Excises and Salt Act, 1944. (b) Rs. 1,700 (Rupees one thousand seven hundred only) per tonne provided that where the exporter has not availed of the procedure under rule 12 or rule 191-A of the Central Excise Rules, 1944, the drawback at the rate specified in (a) and (b) shall apply in totto and where the exporter has availed of pro- cedure under either of the said rules or where no duty under item No. 46 of the First Schedule to the Central Excises and Salt Act, 1944 has been paid, rate of drawback at the rate specified in item (b) above shall apply.

Trade with Pakistan

Public Notice No. 125—ITC (PN) 74
dated the 7th December 1974 has been
issued by the Government of India in
the Ministry of Commerce:

Attention is invited to the Ministry of
Commerce Order No. 9/74 dated the 7th
December 1974 rescinding the Order of
the Government of India in the late
Ministry of Foreign Trade Order No. 2/

Appointment of directors (Sect. 269)
Fixing of remuneration for the Manage-
ment (Sect. 637 AA) Applies to Public
Companies as well as Private Companies
which are subsidiaries of Public Companies.

Up to now the first appointment of a
managing or whole-time director had to
be sanctioned by the Government; re-
appointments had to be sanctioned if
there was a change in remuneration.

According to the new law the Government's approval is necessary for each appointment or re-appointment. The Government has the power to fix the ceilings for the remuneration of directors and managers. While fixing the remuneration the Government shall have regard to the financial position of the company, the remuneration drawn by the individual concerned from other companies or in any other capacity, the professional qualifications and experience of the individual concerned, and the public policy relating to the removal of disparities in income.

Private companies of the following categories become by virtue of Sect. 43 A public company:

- (i) private companies with an annual turnover of Rs 1 Crore and more and
- (ii) private companies holding not less than 25 per cent of the paid-up share capital of a public company. All restrictive provisions which govern the public limited companies will be applicable to those private companies.

The powers of the High Court have been transferred to the Company Law Board in the following cases: (Sect. 17, 18, 19, 79, 141, 186)

- (i) Confirmation of alteration in the memorandum of a company,
- (ii) issue of shares at a discount,

- (iii) filing the particulars relating to registration of charges,
- (iv) ordering of general meetings (except the annual general meeting).

Import of goods as personal baggage under baggage rules

Attention is invited to the late Ministry of Foreign Trade Public Notice No. 13-ITC (PN) 71 dated 1-2-1971 as amended, according to which the concessions indicated in the paragraph 2(a) and 2(b) therein may be allowed provided the Assistant Collector of Customs is satisfied that the articles are being imported for the bona fide use of the passenger or his family and subject to the condition that they shall not be sold or offered for sale or otherwise disposed of within a period of 5 years (10 years in the case of firearm) from the date of clearance.

On a review of the position it has now been decided that goods (other than firearm and TV sets) will inter alia be allowed for import subject to the condition that the same shall not be sold, advertised or offered for sale or displayed in a shop until the market-price has depreciated to less than 50 per cent of their market-price when new. The existing no sale condition of 10 years and 5 years from the date of importation for firearm and TV sets respectively will continue to remain in force (Public notice No. 8-ITC (PN)/75 dated the 3rd February 1975).

Men and Companies

- *Dr M. N. Moorjani*
 - *Shri G. R. Shah*
 - *Dr D. Rajagopal Rao*
 - *Shri J. S. Venugopal*
 - *Dr S. V. Suryanarayana Rao*
 - *Dr K. S. Srinivasan*
 - *Shri K. R. Sreekantiah*
 - *Processed Foods Export Promotion Council*
 - *Indian Standards Institution*
 - *R.R.L., Jammu: Research and Industry*
 - *Indian Institute of Packaging*
 - *National Research Development Corporation*
-

Dr M. N. Moorjani



Dr M. N. Moorjani has been appointed Project Co-ordinator, Discipline of Meat, Fish and Poultry Technology, Central Food Technological Research Institute, Mysore and Chief Co-ordinator, PL-480 Project on Smoke Cured Poultry.

Aged 50 years, Dr Moorjani obtained B.Sc. (Hons) in 1944; M.Sc. in 1947 and Ph.D. in 1949. Dr Moorjani has been guiding M.Sc. (Food tech.) students of the International Food Technology Training Centre, CFTRI and has been Co-ordinator for elective subjects in Fish Technology. He has been assisting the industry with his expert advice on different aspects of Fish, Meat and Poultry Technology.

Dr Moorjani has widely travelled. He went to CSIRO, Australia, during 1955-56 as Senior Fellow under the Colombo Plan for specialisation in the Field of Meat and Fish Technology; West Germany in 1964 to participate in the FAO International Symposium; the United Kingdom in 1969 to attend the International Commission on Food Science and Technology and the South East Asian Countries under FAO assignment in 1971.

Dr Moorjani is the Convener, Meat and Meat Products Sub-Committee of ISI. He is member of Sectional Committee, Meat and Meat Products, Frozen Fish Products, Slaughter House and Equipment Sub-Committee of Indian Standards Institution, New Delhi; Nutrition Research Society and Indian Fish Technology Panel of ICAR and National Commission on Agriculture.

Dr Moorjani has published 53 research papers in Indian journals, 22 in foreign journals, 13 review papers and a monogram.

Shri G. R. Shah

Shri G. R. Shah has been promoted Project Co-ordinator, Central Food Technological Research Institute Experiment Station, Bombay.



Shri G. R. Shah graduated with Honours in Chemistry in 1948 from the L. D. College and M. G. Institute of Science, Ahmedabad. He did B.Sc. (Tech.) in Food Technology from the University of Bombay in 1950.

Shri Shah worked with the Kaira District Cooperative Milk Producers' Union Limited, Anand, as a Research Chemist from 1951 to 1954. He joined the Directorate of Marketing and Inspection, Ministry of Food and Agriculture, as the Marketing Inspector and worked in Bombay, Delhi and Lucknow. He joined the Central Food Technological Research Institute, Mysore, in 1961 as Junior Scientific Officer. He was posted as Officer in-charge, Experiment Station, Trichur. In 1962, he was transferred as Scientist in-charge, Experiment Station, Bombay. He was deputed jointly by the State Trading Corporation of India and CFTRI as a Technical Expert to study the transportation, post-harvesting changes of bananas on voyage and also the marketing of fruits in U.S.S.R.

Shri Shah has undertaken research on grapes grown in Maharashtra; studies on Indian Sweets; Studies on the conditions

of Cereals and Pulses stored in Godowns and has rendered technical advice to set up fruit processing factories.

He is a member of the Association of Food Scientists and Technologists (India).

Dr D. Rajagopal Rao



Dr D. Rajagopal Rao has been appointed Scientist 'E' in the Discipline of Biochemistry and Applied Nutrition. Dr D. Rajagopal Rao had his initial academic training at Andhra University, Waltair, where he obtained B.Sc. (Hons) and M.Sc. degrees in Chemical Technology. After research work in Biochemistry for an Associateship of the Indian Institute of Science, he took Ph.D. in 1958 in Biochemistry at Philadelphia, U.S.A. Later, he was a research associate at the University of California Medical Center, San Francisco; a visiting fellow at the John Curtin School of Medical Research, Australian National University, Canberra and recently as a Senior Fellow of the Alexander Von Humboldt Foundation at the University of Cologne, West Germany. He was associated with the Food Industry for a brief

period as a research manager at the Hindustan Lever Research Center, Bombay.

His research interests have been in the area of proteins and amino acids. He has developed a specific enzymatic method for the detection and determination of *Kesari dhal* neurotoxin. He has carried out extensive work on the mammalian and microbial metabolism of tryptophan, histidine, lysine and some neurotoxin amino acids. To his credit also lies the discovery of L-lanthionine, a major sulphur containing amino acid, in many insects. Currently, he and his colleagues at CFTRI have been working on neurotoxic amino acids, chemical studies on antinutritional factors and structural modification of proteins for conferring functional properties.

Dr Rajagopal Rao has been in the Central Food Technological Research Institute for more than a decade. He is a recipient of the General Sir Arthur Cotton medal of the Andhra University. He is a member of the Society of Biological Chemists of India and Association of Food Scientists and Technologists of India.

Shri J. S. Venugopal



Shri J. S. Venugopal has been awarded Scientist 'C' in the Central Food Technological Research Institute, Mysore.

Shri Venugopal obtained B.Sc. (Hons) from the University of Mysore in 1956 and M.Sc. in Petrology and Mineralogy in 1961 from the Karnataka University. He worked as a Post-graduate lecturer for a year. He also worked as ore prospective Geologist immediately after B.Sc. (Hons) and toured much of the country.

Shri Venugopal joined the Central Food Technological Research Institute as research fellow in 1962. His current field of interest is in optical, thermo-analytical and x-ray analysis of sorptive minerals. He is one of the principal investigators in developing grain protectant based on non-toxic minerals for post-harvest storage. He has also taken interest in clay-pesticide interaction, mineralogical changes during activation and instrumental analytical techniques. He has above 28 publications and co-edited two books on Grain Sanitation and Fumigation, and Gaseous Pasteurization.

Shri Venugopal is a fellow of Mineralogical Society, Clay-Minerals Society, Geological Mining and Metallurgical Society. He is the founder member and former treasurer of the Academy of Pest Control Sciences and has organized many symposia, colloquia and workshop. He was a delegate to International Geological Congress in 1964.

Dr S. V. Suryanarayana Rao

Dr S. V. Suryanarayana Rao has been promoted as Scientist 'C' in the Discipline of Meat, Fish and Poultry Technology, Central Food Technological Research Institute, Mysore.

Dr Suryanarayana Rao graduated from the Andhra University in 1949. He took up research work in Cereals at ICMR laboratories, Coonoor. He has been connected with fish processing for a number of years and was on the staff of the CMFRI,



Mandapam and Central Institute of Fisheries Technology, Ernakulam. He was deputed by the Agricultural Ministry, Government of India, to West Germany under foreign fellowship which enabled him to obtain Doctorate from the University of Hamburg.

He joined the Central Food Technological Research Institute, Mysore, in the Discipline of Meat, Fish and Poultry Technology in 1963. He worked on fish flour, dehydration of salted fish, flavour research on Indian Shrimp and processing of shell-fish. He has also been teaching at the IFTT Centre, Mysore and guiding the M.Sc. and Ph.D. students.

Dr Suryanarayana Rao is widely travelled. He has visited the United Kingdom, France and West European countries and can speak German, French and Russian. Dr Rao is also well known in Telugu literary circles for his interests in literary and art criticism.

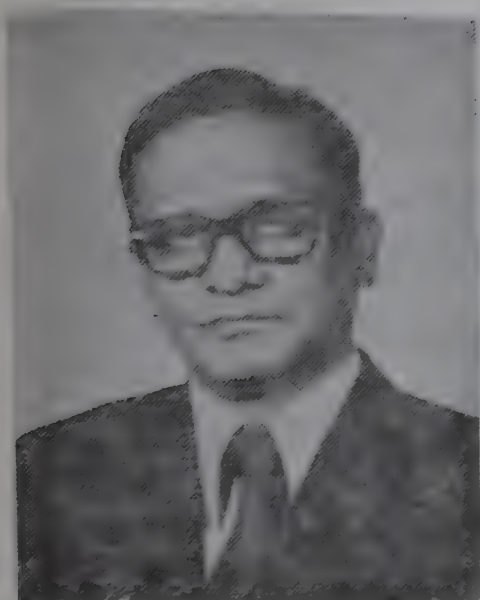
Dr K. S. Srinivasan

Dr K. S. Srinivasan has been promoted as Scientist 'C' in the Discipline of Protein Technology, Central Food Technological Research Institute, Mysore.



Dr Srinivasan joined the Indian Institute of Science, Bangalore, in 1948 soon after M.Sc. from the Mysore University. He worked on problems concerning Agricultural Chemistry and Soil Microbiology. He was awarded Ph.D. degree by the Bombay University in 1955 for 'Studies on Mould Metabolism'.

Dr Srinivasan joined the Central Food Technological Research Institute, Mysore, in 1955 and worked in the disciplines of Storage and Preservation, Food Processing and Protein Technology. He organised a microbioassay unit which has a place of reference for microbiological assay of amino acids and vitamins. Dr Srinivasan visited Japan under the Colombo Plan and worked in Food Research Institute, Tokyo and Institute of Physical and Chemical Research on Industrial Production of Proteolytic Enzymes. He is now engaged on the problem of enzymic modification of vegetable proteins.



Shri K. R. Sreekantiah has been upgraded as Scientist 'C' in the Discipline of Microbiology, Fermentation and Sanitation, Central Food Technological Research Institute, Mysore.

Shri Sreekantiah is a B.Sc. (Agri) which he completed in 1950 from the Mysore University. He joined the Agricultural Research Institute in 1952 after completing the Associateship of IARI, New Delhi.

Shri Sreekantiah is the principal worker and leader of the project on microbial enzyme production and their application in food industries. Processes for the production of pectinase and amylolytic enzymes, preparation of clarified juices from soft fruits and utilisation of tuber starches for potable alcohol production have emerged from his projects. Production of clarified fruit juices has been commercialised by the industry. An enzymic process for the production of lime juice cordial has been adopted by fruit processing factories. He was also actively associated with a project on the study of active principle of garlic and its antimicrobial activity.

Shri Sreekantiah was deputed to Japan as a fellow of UNICEF for 1 year for

specialized training in enzymic processing of foods during 1965-1966.

He has more than 40 scientific publications in the national and international journals and has four patents to his credit. He is a fellow of the Indian Phytopathological Society. He was honorary treasurer of the Association of Food Scientists and Technologists for the year 1972 and Secretary-treasurer of the Mysore Unit of the Association of Microbiologists of India during the period 1970-72.

He teaches industrial microbiology for M.Sc. food technology and has guided many students.

Processed Foods Export Promotion Council

The Eleventh Annual Report was presented to the members at the West End Hotel, Bangalore, on Monday, the 23rd December 1974.

Exporters of fruit, vegetable, meat, milk, cereal, and miscellaneous products, and merchant exporters attended. State and Central Government officials, container, closures and packaging material fabricators also participated.

Shri Kisan Mehta, Chairman, extended a warm welcome to the members and guests. He was happy to inform that fresh fruits and vegetables and animal casings have been brought under the Council. These have earned 7 crores and 1 crore respectively during the year. Exports for the period 1973-74 were Rs 31.03 crores as against Rs 24.48 crores the previous year showing an increase of 26.75 per cent. There was a 50 per cent decline in exports to U.S.S.R. which was made up by exports to free Foreign Exchange countries. He called upon the industry to take advantage of the world situation with regard to sugar and other raw and packing materials. Shri Mehta advocated the organisation of a



ge scale programme for growing, handling and processing vegetables as an industrial activity. Middle East countries have been offering a good opportunity for expanding markets especially for Meat and other products, fresh fruits and vegetables. Guar Gum is another sphere for export improvement. He suggested the idea of exploring ways and means for exporting graded and finished gums so that a higher price could be realised. He called for research efforts to be directed for extraction of Protein Concentrate from Guar gum. He expressed the need for greater efforts for increasing Walnut exports.

After the Coffee break a lively discussion followed. The following were elected to various panels:

Fruit and Vegetable Products

Shri S. Z. Varcie, Tata Oil Mills Co. Ltd., Bombay.

Shri N. P. Chandrasekhara Reddi, Sun-Sip Pvt. Ltd., Hyderabad.

Meat and Milk Products

Shri T. J. Prabhu, Food Specialities Ltd., New Delhi.

Shri S. E. Vasanth Kumar, Cleanfoods Corporation Ltd., Bangalore.

Cereal Products

Shri N. K. Vissanji, Wallace Flour Mills Co. Ltd., Bombay.

Shri A. K. Tejani, Gits Food Products (India), Poona.

Glucose and Confectionery

Shri K. K. Kapoor, Cadbury-Fry (India) Pvt. Ltd., Bombay.

Shri C. S. Champalal, Sooraji Trading Co., K.G.F.

(v) Guar Gum and Soft Drinks

Shri P. C. Joisher, Premcem Gums Pvt. Ltd., Bombay.

Shri P. R. Gupta, Hindustan Gum and Chemicals Ltd.

(vi) Instant Coffee and Instant Tea

Shri N. A. Pandit, Tata Oil Mills Co. Ltd., Bombay.

Shri K. K. Sharma, Brooke Bond India Ltd., Calcutta.

(vii) Miscellaneous Products

Shri V. B. Oberoi, Kissan Products Limited, Bangalore.

Shri S. N. Mitra, Mida and Co. Pvt. Ltd., Calcutta.

(viii) Merchant Exporters

Shri G. S. Gupta, Vivekanand Mills, Bombay.

Shri P. D. Katrak, Zenith Tin Works Pvt. Ltd., Bombay.

Shri G. S. Ramachandra, United Breweries Ltd., Bangalore.

Shri T. S. Bhat, Poysha Industrial Co. Ltd., Bombay.

Shri N. P. Bhargava, Midland Fruit and Vegetable Products (I) Pvt. Ltd., New Delhi.

Shri Devandra Nath, State Trading Corporation of India Ltd., New Delhi.

Shri N. H. Jhaveri, Vasundhra Canning Pvt. Ltd., Bombay.

(ix) Government Nominations

Shri A. Hoda, Deputy Secretary, Ministry of Commerce.

Shri Daya Nand, Director, Fruit and Vegetable Preservation.

(x) *Nominations from the Associations*

Shri Kisan Mehta, All India Food Preservers' Association.

Shri S. P. Chauhan, Indian Confectionery Manufacturers' Association.

Shri P. C. Khanna, Federation of Biscuit Manufacturers' Association.

At the Governing Council Meeting that following the General Session Shri S. Z. Varcie was elected Chairman and S/Shri V. B. Oberoi and N. P. Bhargava Vice-Chairmen.

Indian Standards Institution

The 30th meeting of the General Council of Indian Standards Institution was held at Manak Bhawan, New Delhi, on 15th November 1974. Shri T. A. Pai, Union Minister of Industry, Civil Supplies and Science and Technology, who is also the President of the Institution, addressed the gathering.

Indian Standards Institution had 7,760 Standards in force by 31st March 1974 covering commercial, industrial, agricultural, testing methods, designs, construction etc. During the 4th Plan itself it has published 3,660 standards. The Institution has 28,000 technical experts from several fields. These experts are drawn from Central and State Governments, Industry, Commercial organisations, universities, research and technical institutions and various councils. The Institution was originally set up for formulating standards but the present emphasis is on implementation of standards.

The small scale industries are showing increasing interest in ISI certification scheme. Testing facilities are also required to be established for the benefit of small scale manufacturers. The Small Industries Development Organisation is

engaged in the establishment of regional testing centres at Madras, Calcutta, Bombay and Delhi.

Governments of Assam, Meghalaya, Orissa, West Bengal, Registrar of Co-operative Societies in all States and Union Territories have opted for ISI Certification on their product developments and purchases. Similarly, Union Ministries Petroleum and Chemicals, and Steel and Mines have advised extension of ISI Certification for additional items.

R. R. L., Jammu: Research and Industry

A research and industry get-together was organised between October 21-22, 1974, at the branch laboratory at Srinagar. The get-together was a step in the laboratory's efforts to help local industries in their R and D needs and also in diversification and modernization of existing units.

The meeting was attended by the DGS scientists from CSIR laboratories, representatives from the Central and State governments and the local industrialists.

Shri G. L. Dogra, Minister for Finance and Industries, Jammu and Kashmir Government, inaugurated the meet. There were discussions on the following subjects:

1. Agriculture and horticulture
2. Chemical engineering including pharmaceuticals
3. Forest based industries
4. Food industries including mushroom production
5. Mineral based industries
6. Leather, fur, papier and other handicrafts

The concluding session was presided over by Shri S. Banerjee, Chief Secretary, Government of Jammu and Kashmir.

Committee consisting of Secretary, Industries and Commerce; Director, Central Research Laboratory; and a representative each from industries of Kashmir Province and Jammu Province.

Indian Institute of Packaging

Shri H. N. Kapadia has been elected chairman at the General Body Meeting of the Indian Institute of Packaging held in Bombay on 14th November 1974. Shri Kapadia is a member of the Institute of Packaging, U.K. and Managing Director of the Poysha Industrial Co. Ltd., one of the premier packaging industries in the country.

Dr K. K. Talwar, Chief Engineer, Paper Products Limited; Shri H. B. Mera, President of the Federation of Corrugated Board Manufacturers' Association and Partner of Everest Packaging Corporation; and Shri P. K. Dasgupta were elected to the Governing Body.

Shri M. Ct. Pethachi was re-elected Vice-Chairman. Shri K. Viswanathan has been elected as the other Vice-Chairman.

Dr S. K. Keshava of the Indian Tobacco Company Limited, Calcutta, has been re-elected on the Governing Body.

National Research Development Corporation

The 20th annual meeting of the National Research Development Corporation was

held on 30th December 1974. Dr C.V.S. Ratnam, Managing Director, gave details of the Fifth Plan and said that horizontal transfer of technology to reduce foreign exchange outflow on repeat import of technology has been taken up. Several companies in India are offering the Corporation their know-how on process for transfer to entrepreneurs. This activity will play a significant role in strengthening the base of self-reliance.

Attempts are made to export technology to the developing countries. Other Fifth Plan activities include providing help to individual investors for obtaining of prototypes and commercialisation of their inventions as well as increasing the tempo of licensing activity from national laboratories and other research and development institutions.

During 1973-74, there was phenomenal increase in the licensing activities. On an average, one licence agreement is being signed every working day; the Council of Scientific and Industrial Research (CSIR) provides about 80 per cent of the processes. About 64 per cent of the effective inventions available with the Corporation had been licensed. Among the important processes that has gone into production during the year was the foodgrain purifier.

Eight development projects with an estimated cost of Rs 1.4 crores were sanctioned during the year. The Corporation's share of expenditure in the projects was Rs 70 lakhs.

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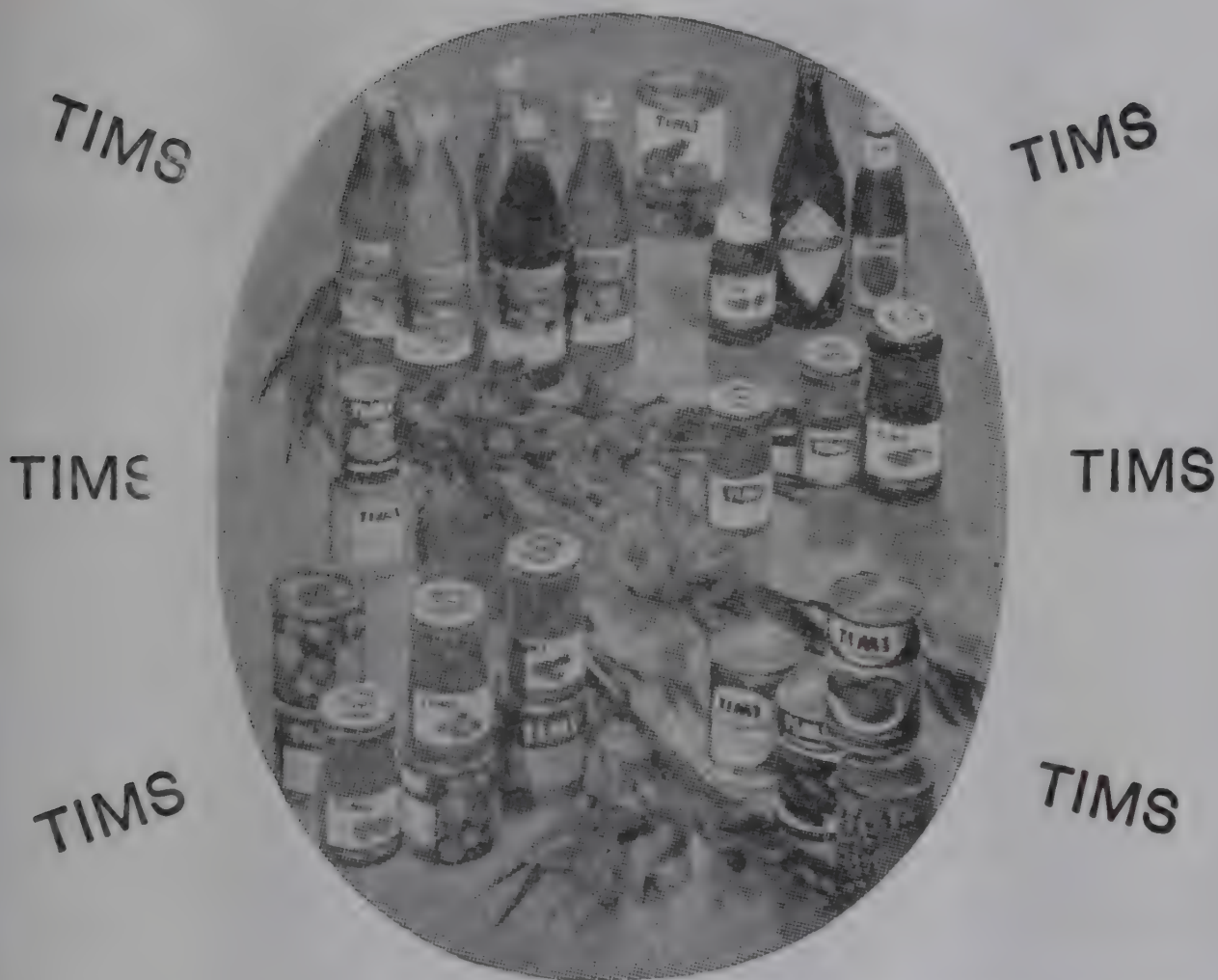
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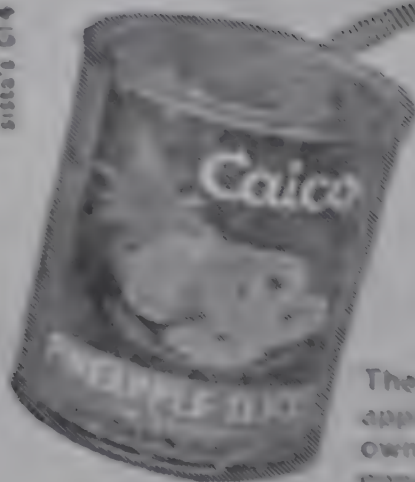
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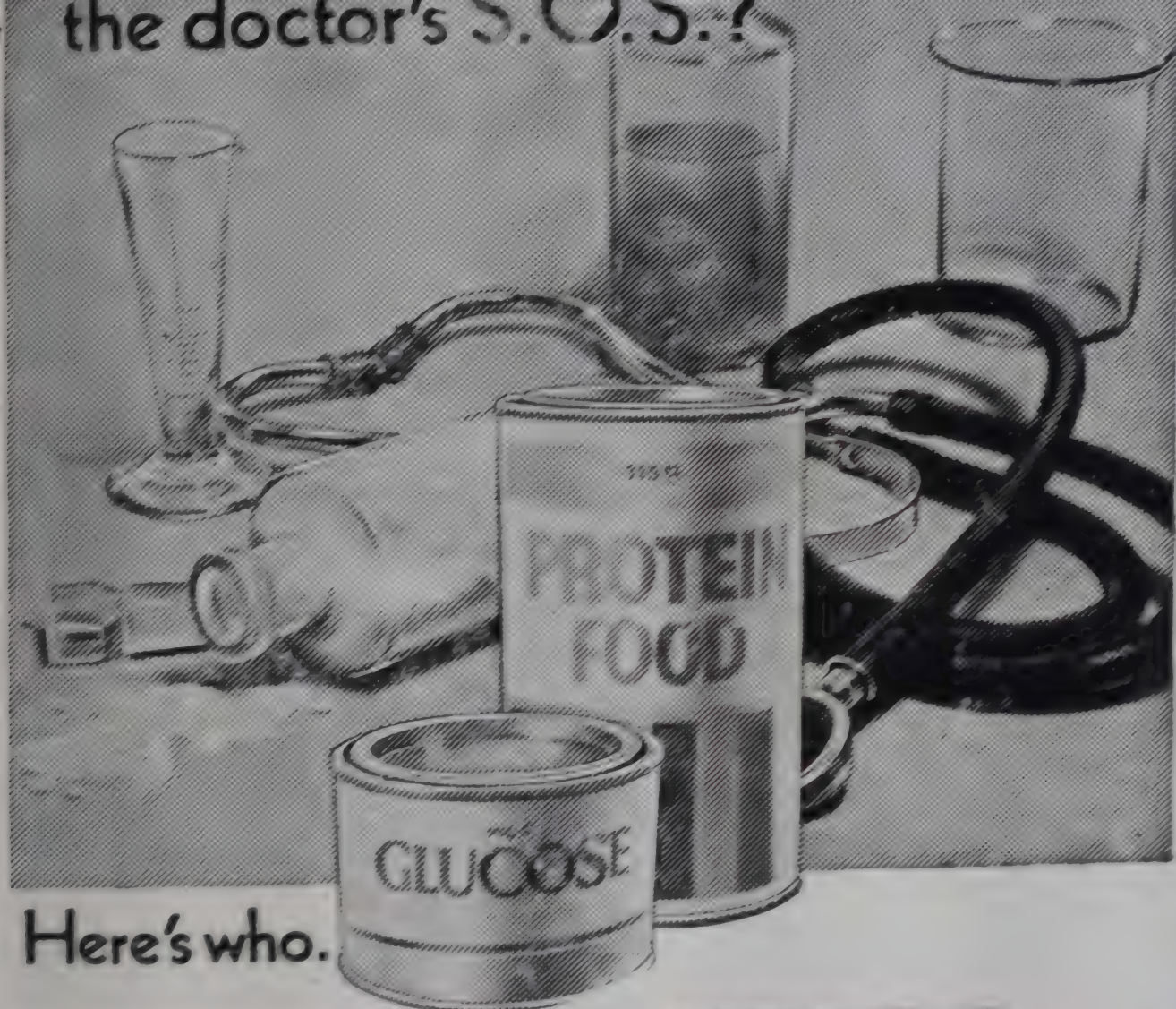
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Vol. XXIX No. 3

MAY—JUNE 1975

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MAY-JUNE 1975

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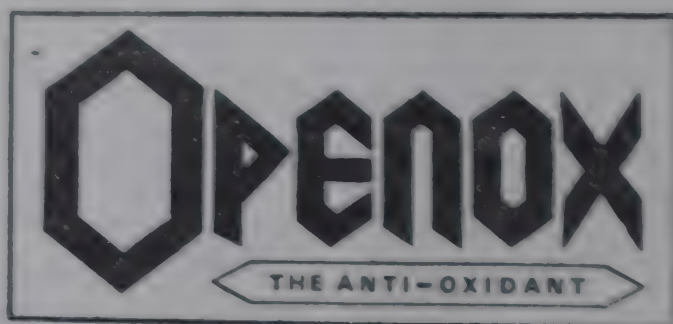
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MAY-JUNE 1975

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Editorial

The Government—C S I R-Industry meet was held in Bangalore on June 7-8, 1975. It was inaugurated by Hon'ble Shri Mohanlal Sukhadia, Governor of Karnataka. The presidential address was delivered by Shri P. N. Haksar, Deputy Chairman, Planning Commission. The 'meet' was organised jointly by the Federation of Karnataka Chambers of Commerce and Industry, All India Manufacturers' Organisation, Government of Karnataka, the Karnataka Small Scale Industries Association and the Council of Scientific and Industrial Research, New Delhi. The survey of the developmental programmes of Karnataka State carried out earlier by the joint efforts of Central Food Technological Research Institute (CFTRI), Mysore; National Aeronautical Laboratory (NAL) and Indian Plywood Research Institute (IPRI), Bangalore, provided the brief for discussion.

The survey report published by Central Food Technological Research Institute, Mysore, presented information on the areas of thrust envisaged in the development programmes of State Government and technological/scientific problems of a cross section of large, medium and small scale industries, with a view to identify the sectors which could utilise the expertise

and other facilities available with the national laboratories. Problems of about 106 organisations have also been listed together with the names of the national laboratories which could render assistance. There is a communication gap between the national laboratories and the entrepreneur which Shri Haksar advised to bridge in order to lessen dependence on foreign technology. The development of industry in backward districts has been given top priority.

The discussion of the survey report elicited enthusiastic response from the participants. The 'meet' served useful purpose of further cementing the relation between the CSIR and Industrial Organisations of State Government and Private Sector. This has resulted in the decision to establish a poly-technological clinic in the State to serve as a contact point through which assistance could be obtained from CSIR and national laboratories.

The Council of Scientific and Industrial Research (CSIR) had undertaken similar studies on the development programmes of Bihar, Andhra Pradesh and Tamil Nadu for establishing closer links through its constituent laboratories with the Industries—State and Private.

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ALL INDIA FOOD PRESERVERS' ASSOCIATION—32ND ANNUAL GENERAL MEETING

The 32nd Annual General Meeting of the All India Food Preservers' Association was held at Hotel Imperial, Janpath, New Delhi, on Thursday 24th and Friday 25th April 1975.

Programme

Inaugural Session

Thursday: 24th April 1975

10.00-10.30: Registration of delegates.

10.30-11.30: Welcome to the delegates and introduction of the Chief Guest, Shri Dharmsinh D. Desai, Member, Lok Sabha, by Shri Kisan Mehta.

President's Address.

Inaugural Address by Shri Dharmsinh D. Desai.

Key Note Address by Shri R. K. Shastri, Joint Secretary, Ministry of Agriculture.

Citation and presentation of Kashalkar Memorial Award for the year 1974.

Citation and presentation of K. U. Patel Memorial Award for the year 1974.

Vote of thanks by Shri N. P. Bhargava

11.30-12.00: Coffee.

12.00-13.00: General Discussions.

13.00-14.30: Lunch.

Technical Advisory Committee Meeting

14.30-16.30: Follow-up points arising out of the last Technical Advisory Committee Meeting held in Poona on 6-7 July 1974.

Differential Tin-coated cans: Storage trials (Metal Box Company of India Ltd.)

Newer topics and product developments:

(a) Freezing of fruits and vegetables (CFTRI).

(b) Alternate packaging materials for fruit and vegetable products (CFTRI).

General Technical Problems of the Industry:

(a) Net weight of tinned vegetables [The Midland Fruit and Vegetable Products (India) Private Limited, New Delhi].

(b) Empty can weight (Herbertsons Limited, Bombay).

(c) Drained weight in canned Lotus products [The Midland Fruit and Vegetable Products (India) Private Limited, New Delhi].

(d) Suitability of tomato varieties for processing (Punjab Agricultural University, Ludhiana; Indo-American Hybrid Seeds, Bangalore; Indian Agricultural Research Institute, New Delhi).

(e) Stability of lycopene in processed tomato products (CFTRI).

(f) Colour in Tomato Ketchup (Herbertsons Limited, Bombay).

(g) Warranty to the vendor: Prevention of Food Adulteration Act (NOGA, Nagpur).

(h) Any other items with the permission of the Chair.

Round-table discussion on Prevention of Food Adulteration Act and its proposed amendments: Department of Food, Government of India,

Ministry of Agriculture, New Delhi.
 All India Food Preservers' Association, New Delhi.
 Central Committee for Food Standards, New Delhi.
 Army Purchase Organisation, New Delhi.
 Indian Standards Institution, New Delhi.
 AGMARK Laboratory, Nagpur.
 Central Food Laboratory, Calcutta.
 Public Health Laboratory, Chandigarh.
 Association of Food Scientists and Technologists, Mysore.
 Central Food Technological Research Institute, Mysore.

Film Show:

The Double Seam: Courtesy—
 Poysha Industrial Company Ltd.,
 Bombay.

16.30-17.00: Tea.

Business Session

Friday: 25th April 1975

10.00-11.30: Approval of the Minutes of
 the 31st Annual General Meeting.

Hony. Secretary's Report.

Passing of audited Statement of
 Accounts for the year 1974.

Approval of Budget Estimates for
 the year 1975.

Appointment of auditors for the year
 1975.

Election of office bearers and members
 of the Executive Committee
 Resolutions.

11.30-12.00: Coffee.

12.00-13.00: New Executive Committee
 Meeting:

Appointment of Convener, Technical
 Advisory Committee.

Appointment of Editor, Indian Food
 Packer.

Co-option of members to the Exe-
 cutive Committee.

Operation of Bank Accounts.

Venue and date of the next Executive
 Committee meeting.

General review of the policy for 1975.

13.00-14.30: Lunch—Courtesy—Poysha
 Industrial Company Ltd., Bombay.
 (Gaylord Restaurant, Connaught
 Circus, New Delhi).

14.30-15.00: Press Conference.

19.30-21.30: At-Home—Courtesy—Zenith
 Tin Works Pvt. Ltd., Bombay.
 (Terrace Claridges Hotel, New
 Delhi).

Over one hundred and twenty delegates from different parts of the country including members, invited participants and guests attended the Conference which was noted for its wide spectrum of representation from industries like fruit and vegetable processing, dairy, meat, fish, non-alcoholic beverages, convenience foods, catering and bakery. The representation was indeed significant inasmuch as the personnel were drawn from different disciplines of the industry, viz. Planning, Research and Product Development, Quality Control, Marketing, Public Relations, Advertising, Export Promotion and Industrial Communications. In addition, there were representatives of fruit and vegetable growers, commission agents, technical consultants, export houses and merchant exporters.

In response to the Association's invitation auxiliary industries such as food, engineering, tin, glass, flexible containers, closures, printing and packaging, manufacturers of additives, enrichments and essential raw materials extended their valuable co-operation by deputing their executives of management, marketing, industrial communications, research and development departments.

The Central and State governments were also represented at the Conference. The Director (F. & V.P.), Joint Director (Consultancy Service Scheme) and Regional Deputy Directors (F. & V.P.) represented the Food and Nutrition Board, Government of India. The Ministry of Agriculture and Irrigation, Department of Food, was represented by the Joint Secretary and other executives. There were participants from Ministries of Commerce, Health, Industries and Civil Supplies; Army Purchase Organisation (C.D.P.); the State Trading Corporation of India (S.T.C.); Council of Scientific and Industrial Research (C.S.I.R.); Indian Council of Agricultural Research (I.C.A.R.); Indian Agricultural Research Institute (I.A.R.I.); Indian Standards Institution (I.S.I.); Food Corporation of India (F.C.I.); Processed Foods Export Promotion Council (P.F.E.P.C.); Indian Airlines (I.A.); Directorate of Fruit Utilisation, U.P. (D.F.U.); State Departments of Delhi, Haryana, Punjab and Himachal Pradesh. The Advertising and Sales Promotion Organisations, Market Research Agencies, Distribution Houses and Wholesale Trade in vegetable products also took part in the deliberations.

A delegation of scientists and technologists specialised in Fruit and Vegetable Technology; Industrial Research, Consultancy and Extension Services; Experiment Stations and Training under the leadership of Dr B. L. Amla, Director, CFTRI made effective contributions at the technical sessions.

The President, Shri Kisan Mehta, called the meeting to order at 10.30 a.m. He extended a cordial welcome to the Chief Guest, Shri Dharmsinh D. Desai, Member of Parliament and Shri R. K. Shastri, Joint Secretary, Ministry of Agriculture and Irrigation, Department of Food and the members, participants and guests. He then delivered the presidential address (full text published on pages 25-30).

Inaugurating the Conference, Shri Dharmsinh D. Desai stressed that the Fruit and Vegetable Preservation Industry which can take into its stride seasonal gluts of perishable fruits and vegetables had a relevance to exist and prosper in the present socio-economic climate of the country. He referred to the heavy burden of direct and indirect taxes imposed by the Government on this industry with the result several units had to close their business in the past and a few more are on the verge of closure. He further said that before he embarked himself on this industry, he had conducted a feasibility study including market research, and despite rather discouraging findings, he decided to enter fruit and vegetable processing industry. He emphasised that this industry had a bright future and will be considered as a service industry to the country. While he was campaigning for the Parliamentary elections he could see glut of onions and other vegetables and fruits which were going waste for want of proper utilisation. He cited the bumper crop of potatoes this year and observed that both the Industry and the market were not yet geared for their effective utilisation. For the first time we have learnt the inadequacy of cold storage facilities available to our farmers. Being the Secretary of the Farmers' Forum of the Members of Parliament, he visited U.P. where the problem concerning the glut of potatoes and onions was very acute. The available cold storages were full and the farmers, more often than not, had to pay exorbitant charges for such a facility. The gluts occur to any crop but what is essential in such a situation is mutual understanding and beneficial involvement in a long-range perspective among the growers, the cold stores and the processing industry. It is known that over 40 per cent of the G.N.P. of India comes from the agricultural sector. The development of the fruit and vegetable preservation industry, in addition to helping the farmer, gives value and added advantage while processing fruit

and vegetable products. He conferred with the Members of Parliament of Balandshahar, Etta, Etawa, Farukabad, Menpuri where the farmers were in distress and suggested them sun-drying in the farms rather than allowing the potatoes to rot. Besides, he had asked the Ministry of Agriculture to study the possibilities of setting up mashed potato units for export. It is common knowledge that the middleman in our country takes away all the advantages without adequately compensating either the farmer or the consumer. He exhorted the industry to establish production units near the growing centres rather than in big cities. The All India Food Preservers' Association should pick up such challenges and help the growers in the country. There should also be protracted efforts to develop new varieties of fruits and vegetables, and attempts at improving the quality of products by Product Development and Research. Further, serious attention should be bestowed on material handling and productivity. He invited the members of the Industry, participants and guests to visit Nadial district to meet the farmers, as also visit his industrial set-up.

The country is passing through a period of financial crisis, and the inflation rate is one of the highest in the world. The interest burden has gone up to as high as 20 per cent. These economic restraints can be overcome by increased production which in turn will bring down the price level. The credit squeeze will also be relaxed after inflation is brought under control. He hoped that the economic position of the country would start showing positive progress after September 1975. He then referred to the evil of adulteration and called upon the industry to fight this menace. Tighter controls are necessary in stopping adulteration. The manufacture of sub-standard products should be laid down upon in the same manner. There should be highest punishment for people who sell adulterated and sub-standard

product. The Parliamentary Sub-committee under the able leadership of Shri Tika Singh has studied the problems relating to amendments of Prevention of Food Adulteration Act (P.F.A.) for submission of detailed report to Government of India. It would be beneficial to genuine manufacturers, if responsible citizens bring to the notice of the Government adulterated products sold in the market. There is a vast potential to increase the production and sale of fruit and vegetable products. The opening of Suez Canal should improve our overseas trade of fresh potatoes, onions, tomatoes and vegetables. The industry should employ newer techniques in preservation and also improve the product profile so as to be competitive in the foreign markets. The scientists at CFTRI and other Research and Development Organisations have a responsibility to help the industry to improve the quality of their products. Indeed this is a joint challenge to our scientists, technologists and industrialists. There should be no delay in R. & D. effort. Horticulture is one of the important areas where maximum help is available through national and international agencies. He said that Saris Foc of which he is the Managing Director has accepted such challenges and are contributing their mite to the development of horticulture and fruit technology in the country. Happily, we have a bright future and let us look forward to it with confidence and utilise our natural resources by hard and devoted work.

Shri Datta then inaugurated the Annual Convention and wished the Conference success. He thanked the organisers for having given him the opportunity to forward his views.

Key note address was delivered by S. R. K. Shastri, Joint Secretary, Ministry of Agriculture and Irrigation, Department of Food, Government of India (published pages 21 and 22).



President's Address



Audience



Audience



Chief Doctor Li Chai-ku B. Kaper and Shui P. H. Bhor



Coffee Break: Shri M. A. Kohli, Mrs Shanta March and Shri P. S. Srinivasan



Technical Advisory Committee Meeting: Dr S. P. Manjrekar and Shri K. C. D



Left: People Industries Company Limited, Bombay



Right: South The States Ltd. Limited, Bombay. From left to right: Salim K. Nigdi, S. K. Salim, M. K. Salim and T. H. Salim.



P. N. Narang and Dr P. K. Kysmal



S Shri Y. K. Kapoor, Varindra Kapoor, Deepak Chopra
and Bhari B. R. Malhotra



**Dr M. V. Patwardhan, Shri P. N. Narang, Dr J. C. Anand,
Dr S. Ranganna and Shri N. K. Saha**



Dr B. L. Amla, Mrs Malhotra and Shri Bahri B. R. Malhotra



S/Shri P. D. Katrak, Dharmsinh D. Desai and S. S. Barodawala



S/Shri P. D. Katrak, R. S. Aroura, S. N. Mitra, N. A. Pandit and N. K. Saha



S/Shri V. L. Sharda, R. Chauhan, B. S. Sood and O. P. Gera



Shri D. S. Chadda, Dr J. Contractor, Dr P. K. Kymal and Shri S. N. Narang



M. S. Kohil and Dr. J. C. Anand

Kashalkar Memorial Award for 1974

Shri Dharmsinh D. Desai presented the Kashalkar Memorial Award to Shri P. H. Bhatt, General Manager (Production), Amul Dairy, Anand, Gujarat, for his contribution to the Food Preservation Industry.

Prafull Harikrishna Bhatt, 52 years, is a B.Sc. Agricultural Graduate of Bombay University (1945). He took Master's Degree in Food Technology from the Oregon University, U.S.A., in 1948.

Shri Bhatt joined Madhu Cannings, Bombay, as Production Manager on return to India in 1949. From 1952 to 1959, he worked as Development Officer and Senior Marketing Officer, Ministry of Food and

Agriculture, Government of India. He joined the Kaira District Co-operative Milk Producers' Union (Amul Dairy) in 1959 as Manager (Administration and Commercial).

Shri Bhatt was the leader of the National Productivity Council Team of Food Processing Industries which toured Denmark and U.S.A. The Food and Agricultural Organisation (FAO) of the United Nations deputed him as Marketing Expert to Saudi Arabia in 1965. He prepared reports on Cold Storage Industry and Regulations, Enforcement of Quality Control Standards in Saudi Arabia. He proceeded to Rome in 1967 as Food Technologist in Food and Agricultural Organisation. He was Hony. Director,

Agriculture Production and Productivity Service Co-operative Union Limited, Kaira District and Director, Gujarat Agro Industries Corporation Limited in 1972. At present, he is the General Manager (Production), Amul Dairy, Anand.

Shri Bhatt is a member of several committees appointed by the Government of India and Member, Executive Committee, All India Food Preservers' Association.

K. U. Patel Memorial Award for 1974

Shri Dharmsinh D. Desai presented the Award to Dr S. Ranganna, Scientist, CFTRI, Mysore, for his paper 'Pink Discolouration in Canned Fruits and Vegetables—Guava (*Psidium guajava* LINN)' published in the January-February 1974 issue of the Indian Food Packer, (Vol. XXVIII, No. 1).

Dr S. Ranganna, after graduating in Agriculture from the Banaras Hindu University in the year 1950, completed the Associateship Course in Fruit Technology in 1959 at the Central Food Technological Research Institute, Mysore, and did Ph.D. in Food Technology from the University of Mysore in 1973. He has been working in the Central Food Technological Research Institute for nearly 2 decades.

Dr Ranganna, along with co-authors, published 30 research papers in both Indian and foreign journals and a number of review papers. His book entitled 'Manual Analysis and Quality Control in Fruit and Vegetable Processing' is expected to be ready soon.

Dr Ranganna's research interests in the field of fruit and vegetable processing have been varied. Fruits and vegetables like pear, guava, litchis, banana, cabbage, cauliflower, some varieties of pineapple, peas and beans which contain leucoanthocyanidin and are initially white or green in colour become pink on canning. The problem is world-wide and has defied solution so far.

Dr Ranganna successfully isolated the chromogen formed on canning for the first time which enabled him to demonstrate the processing factors contributing to this discolouration, elucidate the mechanisms of discolouration, characterize the chromogen formed and develop measures for control. In recognition of the pioneering research in this field, the K. U. Patel Memorial Award for the year 1974 is given to him. Incidentally this is the second time he has won the Award. He and his former student, Shri B. Raghuramaiah, were given the first K. U. Patel Award in 1971.

TECHNICAL ADVISORY COMMITTEE MEETING

The meeting was convened by Dr S. P. Manjrekar, who moderated the discussions. Two Sessions were held—one in the afternoon of 24th and the other in the forenoon of 25th April. Both these sessions were well attended and the participation was lively. The following topics were discussed:

1. Differential tin coated open top sanitary cans.
2. Internally lacquered cans for mango juice/nectar.
3. Net weight of canned vegetables.
4. Drained weight in canned Lotus Stem.
5. Empty can weight.
6. Warranty to the vendor.
7. Suitability of tomato varieties for processing and colour in tomato ketchup/sauce.
8. Freezing of fruits and vegetables.
9. Alternate packaging materials for fruit and vegetable products.
10. Round-table discussion on Prevention of Food Adulteration Act (PFA) and its proposed amendments.

(1) *Differential tin coated open top cans*

Mr K. C. Dé, Manager, Research Department, Metal Box Company of India Limited, Calcutta, explained that a trial programme has been agreed with the Central Food Technological Research Institute, CFTRI, Mysore, with external coating levels of E 100, 50 and 25. Externally lacquered and lithographed cans are also to be included in the trial. The experimental cans will be fabricated and despatched to CFTRI, Mysore.

It was suggested that some filled cans could be given to the Defence Food Research Laboratory, Mysore, for transport and storage trials in dry and humid conditions, as well as at high altitudes.

(2) *Internally lacquered cans for mango juice*

Mr K. C. Dé referred to the problem of high tin content in mango juice packed in plain cans and mentioned the difficulty of ensuring the low limits of tin (100 ppm) as prescribed in some export markets. Such a limit would pose no problem, if the cans are internally coated with an appropriate lacquer. There are problems in flavour retention for which further trials should be conducted by research institutions as well as the food industries.

One of the problems of lacquered cans is that the lead pickup increases, which, although negligible, is likely to be critical when very low limits, like, 0.4 ppm or less are stipulated. In order to avoid this, one could use pure tin instead of the conventional tin-lead alloys for soldering can body. The extra cost for this would be negligible.

It was further pointed out that the tin-lead solder is not the only source of lead in canned fruits. Other sources included lead naturally occurring in foods or present in ingredients, water and atmospheric pollution and from pesticides, like organo-metallic compounds. It was felt that monitoring of the zinc, tin and lead content should be done on raw and processed materials. The accepted permitted limits of lead are between 0.3 and 0.5 ppm.

(3) Net weight of canned vegetables

Shri N. P. Bhargava, Vice-Chairman, Processed Foods Export Promotion Council, initiated the discussion. He mentioned that, according to U.K. Laws, if the net weight is even 10z. less than the declared weight on the label, severe penalty is imposed. This difficulty was faced by him with special reference to *Tinda* and *Karela* in brine. It would be safer to amend the label, e.g. 14 oz. instead of 15 oz. in No. 1 Tall cans. The drained weight is calculated on the basis of actual net weight (55 per cent) and not the declared net weight, and so the canned product may not meet the FPO specifications. He suggested that the drained weight should be calculated on the basis of declared net weight and not on the actual net weight.

It was pointed out that the drained weight is dependent upon the specific gravity of the raw material, temperature and brix of the covering medium and spilling during sealing. The need for standardization of the net weight and drained weight for each product was expressed. The matter could be referred for relaxation by the FPO.

(4) Drained weight in canned Lotus products

This was a special request by Shri N. P. Bhargava with respect to a specific commodity which, being of a very low specific gravity, does not give a minimum drained weight as required under FPO, although accepted by the importing country. He called for lowering of the minimum drained weight. It was pointed out that specifications for such products would be taken up when the FPO is being revised but till such time a quality certificate will be given if the foreign buyer is agreeable.

(5) Empty can weight

This problem was raised by Shri P. M. Shah, Production Manager, Herbertsons

Limited, Bombay, who has stated that as empty can weights vary as much as 10 per cent it would be necessary to make an allowance in the drained weight to the extent of 1.5 to 2 per cent.

It was pointed out that, according to international specifications, a variation of 5 per cent is permitted within the cans of specific size. If a can from the same batch is utilized as tare weight, this variation is very much less (only in about 1 per cent of the cans) and, could be neglected. The risk is further minimized by taking the average drained weight of more than one can within a batch, before action could be taken by the FPO.

(6) Warranty to the vendor

According to the revised PFA specifications, a warranty period of one year is required to be declared on the label. This aspect aroused considerable discussion. Shri A. C. Batra, Production Manager, Nagpur Orange Growers' Association (NOGA), Nagpur, pointed out that the product after manufacture reaches the vendor after some delay, due to the distribution and redistribution systems. The product may also be exposed by the vendor to sunlight and heat in the shelves. The data regarding shelf-life of different products under varied climatic conditions, existing in our country, are not available. He suggested that the amendment be dropped till such time as the shelf-life of various processed products becomes available.

It was pointed out that the warranty period is to tie the supplier to take care of any variation in quality of the raw or processed foods. The defence organisation, for example, has a well-organised warranty-enforcing system, which re-examines products on the basis of their date of manufacture and sends them for consumption before the date of expiry. It was felt that

the declaration of the date of manufacture is no guarantee to the consumer and that it is difficult to lay down the date of expiry for different products. Manufacturers and vendors knowing the conditions of processing and storage should be in a better position to work out the shelf-life for different products. It was agreed that this may be referred to the PFA for reconsideration.

(7) *Suitability of tomato varieties for processing and colour in tomato ketchup*

In view of the recent ban on addition of artificial colour in tomato ketchup/sauce, a need has been felt for growing tomato varieties with high lycopene content. The parameters of stability of lycopene during processing had also aroused considerable interest. With this end in view, as also requested by Herbertsons to utilize natural colours in tomato ketchup solely for the purpose of standardizing the final appearance in order to maintain uniformity, a discussion on the suitability of tomato varieties for processing and the stability of lycopene in processed tomato products was held. Shri K. K. Mookerji, CFTRI Experiment Station, Ludhiana, presented the work done in collaboration with the Punjab Agricultural University. He mentioned that *Kekrith* is well suited for ketchup manufacture. Mr Susanta K. Roy of Indian Agricultural Research Institute (IARI) mentioned that *Pusa Ruby*, *Roma* and *Chiku Grandy* are rich in lycopene content. Mr K. L. Kapoor, Directorate of Fruit Utilization (D.F.U.), U.P., recommended *Serial-152* and *Hissar-102* for processing. He also recommended a controlled atmosphere ripening for colour development. Shri S. E. Vasantha Kumar, Managing Director, Clean Foods Corporation, Bangalore, explained the work carried out by them to evolve different varieties of tomato both for marketing and processing. It was felt that the oval varieties, which fetch less price in the market as compared

to the globose varieties, were good for ketchup manufacture.

Dr M. V. Patwardhan, CFTRI, Mysore, reviewed the information regarding factors affecting the ultimate colour of the products and mentioned that high temperatures, oxygen, chlorophyll, metallic ions like iron and copper; and some additives like salt, spices, are detrimental to the colour stability of tomato ketchup. Limited work done on varietal suitability has shown that a minimum concentration of 3.5 mg per cent lycopene in tomato juice is essential to produce tomato ketchup of acceptable quality. Tomato varieties, with more than 6 mg per cent lycopene, gave tomato ketchup of attractive colour.

During the discussion, it was felt that it is necessary to propagate suitable varieties for processing, which have withstood economical considerations in various agro-climatic conditions. The use of varieties which ripen from inside to outside would eliminate the risk of residual chlorophyll content in apparently ripe tomatoes. It was suggested that experimental farms of 25-30 acres could be set up by the factories to collect economic data and processing trials on these varieties. From the processor's point of view, a variety which would have an average of 6 per cent total soluble solids at a price of Rs 450 per ton would be suitable for processing. It was felt that the PFA would not agree to the standardization of the product with natural colours since the main purpose of imposing this ban would not be served.

(8) *Freezing of fruits and vegetables*

Dr S. Ranganna, CFTRI, Mysore, presented a review paper. Time is ripe to study the possibilities of freezing preservation of fruits and vegetables, in view of the enormous increase in the cost of tin and glass containers and that the concept,

一、目的：通过本课程的学习，使学生了解我国教育史的发展概况，掌握教育史的基本理论、基本知识和基本方法，为从事教育工作和进一步研究教育问题打下基础。

10. *Describe policy options for
fuel use beyond 2020.*

The following is a list of the names of the persons who have been appointed to the various positions in the various departments of the Government of the State of New York, for the year 1900.

Each year a similar plan involving several international meetings in the various world regions and the holding of seminars and symposia will be the foundation, which are now being set up. These should involve countries in the region to develop a broad cooperation and exchange and national level of the people in India and other developing countries. Further still to the complexity of the problem. Cooperation with and integration of the various countries is essential in the twenty-first century. The Government of India is now in the process of

On the basis of the information it has received, the Commission is not convinced that the foreign countries are

[illegible]

The population was also exposed to the possibility of receiving food from government stores and also the other products which are considered for pricing in domestic market. All the three scenarios were separately taken in consideration to study the alternative pricing for the existing food products.

1. *Journal of the American Medical Association*, 1997; 277: 103-107.
 2. *Journal of the American Medical Association*, 1997; 277: 108-112.

1. The Commission has the honor to acknowledge the receipt of your letter of the 10th of June 1964, in which you inform us that you have been appointed as a member of the Commission.

It is a common mistake to think that the only way to protect the environment is to ban all development. This is not only unrealistic, but also counterproductive. The key is to manage development in a way that minimizes its impact on the environment. This can be achieved through a combination of regulatory measures, such as zoning laws and environmental impact assessments, and voluntary measures, such as sustainable building practices and conservation programs. By working together, these measures can help to ensure that development is carried out in a responsible and sustainable manner.

before the FPO and PFA decided on specifications for processed foods, standards from other countries be taken into consideration and implemented, where possible, knowing the limitations of production and processing as prevalent in this country. It was also pointed out there could be a lax attitude of the Government in matters where there is no risk to the health of the consumer, but strict punishment is necessary to curb violations which involved health hazards.

Business Session

The Business Session was held in the Ball Room, Hotel Imperial, New Delhi, on 24th May 1975.

Shri Kisan Mehta Presided.

Shri Hony. Secretary presented the report for the year 1974.

The accounts for the year 1974 were passed and budget estimate for 1975 approved.

The following are the elected and co-opted office bearers:

President: Shri D. D. Desai, Member, Lok Sabha, 22 Janpath, New Delhi.

President: Shri B. R. Malhotra, Weakfield Products Co. (India) Pvt. Ltd., Weakfield Estate, Nagar Road, Poona 411 014.

President: Shri I. J. Pari, Kisan Products Limited, Bangalore 560 016.

Secretary: Shri Y. K. Kapoor, Northland Industries, 2254 Rajaguru Road, New Delhi 110 055.

Members, Executive Committee:

Northern Zone

Shri M. L. David, Mulberry Aquatic Products Limited, Ullal 574 159, South Kanara.

Shri S. H. Hutan, Kamadhenu Co-operative Dairy and Fruit Processing Society Ltd., Sirsi, N. Kanara.

Northern Zone

Shri Kapil Mehta, Mehta Mehta Breweries Ltd., Mehan Bagar, U.P.

Shri N. P. Khargare, The Midland Fruit and Vegetable Products (India) Pvt. Ltd., New Delhi 110 029.

Western Zone

Dr R. T. Doshi, Fortipoint Engineering Co. Pvt. Ltd., 'Jambhary', 26th Road, Bandra, Bombay 400 056.

Shri H. P. Kardikar, Corn Products Co. (India) Pvt. Ltd., Shree Niwas House, H. Somani Marg, Bombay 400 011.

Eastern Zone

Shri V. L. Sharda, Tinos Products Ltd., Belgharia, Calcutta 700 056.

Shri S. N. Mitra, Mitra and Co. Pvt. Ltd., 33 Biplabi Basubihar, Basu Road, Calcutta 700 001.

Co-opted Members:

Shri Kisan Mehta, The Coca-Cola Export Corporation, 14-A Nizamuddin West, New Delhi.

Shri P. H. Bhatt, Kaira District Co-operative Milk Producers' Union Limited, Anand 388 001, Gujarat.

Dr N. K. Desai, Saras foods (Division of Power Cables Pvt. Ltd.), National Highway No. 8, Dharmash Park, Nadiad, Gujarat.

Shri H. N. Kapadia, Poysha Industrial Co. Limited, Twicken House, Dr E. Moses Road, Bombay 400 011.

Permanent Invited:

Director, Central Food Technological Research Institute (CFTRI), Mysore 570 013.

Director (F. & V. P.), Ministry of Agriculture and Irrigation, Department of Food, 200-G Krishna Bhawan, New Delhi 110 001.

Secretary, Central Committee for Food Standards (C.C.F.S.), Ministry of Health, Nirman Bhavan, New Delhi 110 001.

Hony. Ex. Secretary, Association of Food Scientists and Technologists (India), Central Food Technological Research Institute, Mysore 570 013.

Convener, Technical Advisory Committee:

Dr S. P. Manjrekar, Chairman Training Centre, Central Food Technological Research Institute, Mysore 570 013.

Editor: Shri V. B. Oberoi, Kissan Products Limited, Old Madras Road, Bangalore 560 016.

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ADDRESS OF THE PRESIDENT

SHRI KISAN MEHTA

Ladies and Gentlemen:

On behalf of the All India Food Preservers' Association, I extend a cordial welcome to all of you who have assembled here for our 32nd Annual General Meeting. I am grateful to Shri D. D. Desai, Member of Parliament, for having kindly consented to inaugurate our annual conference and to Shri R. K. Shastri for having agreed to deliver the key note address. We deeply appreciate this gesture which is a measure of the interest they take in the progress of our industry.

The past year has been another very difficult one not only for our industry, but for the country and the world. The fires of inflation have raged high and have damaged grievously the chances of economic revival and progress. The abnormally high rates of inflation, which have plagued India for the last two years is a common phenomenon all over the world and rising prices, combined with recessionary trends in production, has become a global one. The Government instituted a package of control measures in the second half of last year and these combined with a good 'rabi' have brought some relief to India.

Recent statistics show that the rate of inflation has come down from 31.9 per cent in September 1974 to a little over 8 per cent in March 1975. More encouraging still, is the fact that the wholesale price index has come down from 330.4 in the third week of September 1974 to 307.0 in the third week of March 1975. These indicators, as also Government's determination to take steps to revive industry and agriculture, would suggest that we have touched the bottom of the trough and from now onwards the trend

will be upwards. The 'rabi' has been good. Let us hope that the monsoon will smile on us this year.

However, for us in this industry the difficult days are not yet over, for as was to be expected one of the first casualties of these trying times has been our industry.

At the best of times we have had to struggle to exist; during these past few months we have barely managed to survive.

Last year, I had raised certain basic questions and suggested that we consider these, in some depth, amongst ourselves. Such consideration would have been of value to us in understanding our situation better so as to be able to tackle our problems better. But in the difficult days that we have been experiencing there was little time to spare for these larger issues. Hopefully, in the next few years, when the general environment improves, we will be able to devote some time to these basic considerations.

I had also raised some specific areas in which we would require relief from Government. Unfortunately, here too, not much progress has been made in obtaining Government's sympathetic consideration. Since these are very basic and key to the survival of our industry, I am stressing once again the major areas in which Government's help is sought.

Levy Price Sugar: Sugar is an important ingredient used in this industry. It constitutes 20 to 30 per cent of the factory cost of squashes, jams and jellies and other similar products. In recent times, we have seen prices as high as Rs 490 per quintal. Cost of production can be substantially reduced if levy sugar is made available to the industry.

users while at the same time protect responsible manufacturers. More often not, however, these 'poisoning agents' are interests which cause harassment to the good and the bad. The motive for such harassment is typically not mixed with the consumers' interest, but other sinister motives.

It is malpractices, which one must be able and acknowledge as being very very spread, not only severely discredit industry and protect the manipulative class in the industry, but also discourage decent reputable manufacturers and others.

Our Association was called in by Government to tender evidence before the Joint Committee reviewing the proposed standards. In the course of the session attention was drawn to the malpractices of implementation. A plan was made for setting up a check mechanism in the form of a 'Screening Committee' at local level, both to oversee these implementing agencies as also to provide protection to the legitimate manufacturers to avoid harassment and to introduce a system of giving warnings in border line or technical cases. Your Association will continue its liaison work with Government in regard.

I would like to re-emphasise that we in organised sector of industry accept fully manufacturer's responsibility to the people, to ensure that the norms and standards for our industry are such as will ensure safe and healthy products.

The control and prevention of spurious manufacture and adulteration is a very vital part of the total approach, and, we are, therefore, in line with Government in instituting measures that will effectively deter unscrupulous elements from undertaking such activity. However, as stated earlier, we would once again impress that in implementing its measures Government has an equal

responsibility to protect reputable and honest manufacturers so that they are able to carry on their business in an efficient and orderly manner.

Such a request implies matching responsibility on the part of all of us in the industry to take the necessary steps to provide safe and unadulterated products, of a good quality. This means that we must accept the implementation of rigid quality controls of our manufacturing activities and ensure that our products are so manufactured and packaged as to have the necessary shelf-life.

This will require that we introduce into our industry a strong sense of discipline and self-regulation. In all honesty we must admit that at the present time this is not there. Until we can ensure these minimum standards we cannot claim any rights or status either from the consumer or from Government. I would, therefore, submit to all of you that in line with Government's approach on the regulatory aspect we should also develop our own code of conduct with regard to basic norms and standards of manufacture.

Are We a Relevant Industry?

Very often the comment is made that our industry has no place in the India of today or even that of the short-term tomorrow. The charge is made that our products appeal to only an elite few; that our products are too expensive, and for the present, due to high input costs, this price deterrent will remain so; that our products may be appropriate in a highly developed society, where other basic needs have been met, but not to India.

All these are valid points.

But let me make a few observations on the industry as viewed not from the consumers' end but from the producers' end. By the producer I do not mean all of us working in this room, who are concerned with the manufacture of processed foods, but, I am referring to the farmer in the field who

gives the product which is not listed in material input.

It is not our national purpose to restrict the productivity of our land—such restriction comes not only by increasing the yields of cereals, but also from increasing yields of fruits and vegetables. Our land is growing under-cultivated in the growing of such fruits and vegetables and the prospect for improvement from the land, which is already available, and the prospect already there, and already under-cultivated, is something

THE UNIVERSITY OF CHICAGO

It just, these questions have remained
open, and let us show your interest in a
very real, genuine that emerges

It is not as if there is a single kind and quality of knowledge, which would make it possible to measure its value in terms of its contribution to the economy, and which would also bring to market the culture in the widest sense, a new way of thinking and expression, a new mode of production, and it is important for establishing a system that will allow the cultural capital that we have made the product of this knowledge to be put to use.

I need only refer to the recent Principles that in North East India and the area were issued from the U.P., which clearly indicate that only adequate armed force is needed for public order and tranquillity and all our endeavours to bring about peace and order in the North East should be directed towards this.

Such material is limited on the floor only in the west.

It is setting up a much more efficient local product purchasing and distribution system which will bring the product to market in adequate quantities at prices that are fair to both grower and consumer.

The following is a list of the names of the persons who have been appointed to the various positions in the various departments of the Government of the State of New York, for the year ending December 31, 1900.

As mentioned earlier, a change in soil structure was the most significant effect.

The hypothesis is that the mechanism of movement for the α will not be possible without the β and γ subunits.

Now we come to a more difficult task, one that I feel we must all

As we are entering, together, in this very important year in the event of the trial and especially the trial, we must be aware of the

After much time searching, we have come to the following conclusion:

There are many factors which
are in keeping the rate. Large
and important and that there is
no other method as the only
one that is the only one of the
and growth. There are many
such a fact. Some of them are
policy and various approach to
adopted in making such policy a
policy producing a set range of
which we find some manufacturing
and part of the world. The other
more significant ones are the
second factor which is the
the policy.

The major focus point is that all the participants agree on the meaning of their and especially on how a small scale of work is done. Finally, there are two main

management given to larger units to undertake such growing, but, there are in fact several very significant inhibiting factors which prevent such involvement. The basic cause is perhaps Society and Government's attitudes towards land, its ownership and its operation. I cannot see this basic attitude changing and, therefore, any 'Risk Capital' being attracted to it in any significant manner. Thus it is necessary to devise appropriate operating mechanisms that can prosper and develop within this reality.

The issue is a very complex one and it would be foolish to try and solve it at one stroke. However, I would like to make some suggestions as to possible structures that may be relevant. These are first suggestions only and I would propose that our Association in consultation with Central Government Departments, State Agro Authorities, Management Institutes and others study this matter in some depth so as to come up with realistic and practical solutions.

Two Ideas

I am putting forward, for your consideration, two ideas which are each quite different from the other. These should not necessarily be considered as alternatives but as two parallel approaches. In a country, such as ours, which is both geographically vast and socio-economically operating on a number of levels of development, it might be appropriate to adopt a number of approaches which may be quite different in basics, but, it is meaningful to meet the different situations which exist at the same time.

The first approach is perhaps more conventional inasmuch as it implies the drawing-in of large scale processing operators, who would work in conjunction with groups of growers, to set up jointly a modern food processing industry. We cannot, for very good and valid reasons, provide these large scale operators ownership of the land that

they may require for growing the produce that they would process. What we could consider is to have these large scale processors provide technological inputs and development assistance to groups of growers who would in turn be committed to grow and sell back to the processors certain minimum quantities of produce of certain minimum standards at certain agreed prices. This will involve considerable inter-action between large scale processors and numbers of growers. That such inter-action systems can be developed has already been proved by several projects undertaken in many different countries of the world. The more recent ones are the programmes undertaken by several international aid agencies acting in conjunction with Governments and growers on the one hand, in countries like Korea, and technical experts from industrialised countries on the other. In our country, too, we have an instance of this in the recent Himachal Pradesh apple project which is being undertaken with World Bank assistance.

But an important element in ensuring the success of such projects is to see that not only is the produce grown and processed, but, that it is thereafter adequately marketed.

For this reason, therefore, it is most urgent and essential to seek the help of governments, to enlist the active collaboration of large commercial organizations to involve themselves in the field of food processing on a large scale. The examples of such large scale commercial organizations having most successfully undertaken the growing of the raw produce are few and far between. We need several successful cases of depth involvement in fruits and vegetables industry from pineapple and citrus orchards to tomatoes and apples.

The other system to which I would like to refer is diametrically different to this large scale approach. One might, to coin a phrase, describe it as the 'barefoot brigade' approach. Such a system envisages the

Received 10 June 2007; accepted 10 June 2007

[illegible]

KEY NOTE ADDRESS

Smt R. K. SHASTRI

*Joint Secretary, Department of Food, Ministry of Agriculture and Irrigation,
Government of India, New Delhi*

It gives me great pleasure to be here today as a member of the 12th Annual Conference of the All India Food Preservation Workers' and say a few words. The situation in our country, and in other developing countries, has been a difficult one the last 2-3 years have been particularly bad for us. We are afflicted by the old food shortage all over the world. We are certain basic food habits of our people, who to a great extent rely completely on cereals. Hon'ble Minister for Agriculture and Irrigation, Shri Jagjivan Ram, has been trying to motivate the people in eating fruits, vegetables and non-cereals, to reduce their dependence on cereals. Efforts are made to step up production of cereals. It is necessary to ensure effective use of available resources to keep our losses at highest limits of permissible as afford at present. The task of preservation would be one aspect of the total job of trying to have consumption of all as well as a gradual shift to the intake of other foods. The supplementary nutritious foods, particularly root crops, and vegetables, have a vital role to play.

I have not been very long in this argument but what little I know certainly takes a depressing position. There is only large production of fruits and vegetables of the order of 35 million tonnes per

Nearly 1/5th and perhaps even 1/4th reported to go waste. It is essential that something is done about this. Conservation of food material and making it available to people will add to our food resources help in bringing down over-indulgence and consumption. Something has been said about glut in potato. It is not for the

first time that we have this glut. It has often taken place in the past. The Agriculture Department has taken a special plan of action for intensive increase in acreage under potato cultivation. This also has played a part in the present glut. The situation where the farmer gets something like 15 or 16 rupees for a quintal of potato is certainly not good. There have been plans of cold storages and refrigerated containers but still when we have such a situation of what is considered a glut, there are always some problems. Government has been considering measures to overcome such situations. Short-term measures were taken but these do not solve the problem. It is essential that we apply ourselves to considering some long-term methods on how the availability of potato can be effectively utilised and how it can add to the food resources of the country, thus extending food on all fronts. The Minister of State for Agriculture, Shri Shahzawaz Khan, was recently in the United Kingdom. He has brought samples of bread and biscuits containing upto 20 per cent of tapioca flour. Apart from tapioca which we have in the South, there is good possibility of large scale utilisation of potato. This matter has been taken up with by CFTRI and leading industries. The food preservation industry should consider ways and means of a breakthrough where conservation of potatoes in processed forms, apart from cold storage, is taken up as quickly as possible. Any assistance that might be required would certainly be considered by the Government.

The conservation of fruits and vegetables does not seem to be any different from that of potatoes. Agro-climatic conditions in

India are suitable for producing tropical, sub-tropical and temperate fruits. There is a promising foreign market for fruit and vegetable products and quite a bit of export is already taking place. In the total context, it appears just $\frac{1}{2}$ to 1 per cent of our fruit and vegetable production is processed. Increase in agricultural production is closely linked with success of conservation and effective utilisation of the produce. Fruits and vegetables are liable to spoilage and also there is the problem of seasonal gluts. There have been bottlenecks in handling and transportation. Consumption has not been as adequate as it should be consistent with the production and there is loss of what is a very valuable commodity. A well developed food industry is necessary to take care of such surplus production. This would facilitate storage and distribution and provide a steady market for these perishable commodities. This will enable to take full advantage of seasonal abundance and fill up gaps of supplies in off season. Government has been quite concerned of these problems and is taking various measures to develop the industry. In the small sector and for the benefit of the common man, Government has set up a large number of community canning and fruit preservation centres in the states and are considering setting up some more. These provide training and education in different methods of preservation and provide consumer service for preserving fruits and vegetables. To help the industry to ensure standards of quality and hygiene and to provide technical advice and assistance, there is a Fruit Products Order (F.P.O.) which is administered by the Department of Food, under which there is a special kind of inspection for products meant for export. There are plans for large scale agro complexes which would combine the economies of large scale agricultural production, specialised storage, processing and marketing. This integrated approach will help in improving productivity and reduce costs and enable

us to compete in the international markets.

This is only part of what is required to be done. The industry has to rise to the occasion, realising that national need of the hour, to increase exports by modernising their factories, adopting latest methods, diversification and production pattern and improving efficiency to reduce the costs. It is the function, and duty of the Government to consider various difficulties and problems that arise from time to time for the industry, namely, supply of levy sugar, high cost of sugar and tinplate and excise duty. These are not easy subjects to handle. I do not know if anything would be possible in these areas. With this kind of constraint, the industry should consider other possibilities of better economies of higher efficiency of which they are the best judge and large scale production within our social objective. These are matters which should be discussed and considered in depth along with Government in different departments dealing with the subjects.

There have been discussions with representatives of the World Bank and the indication given to us is that they are interested in helping us in a suitable manner. We should put up concrete proposals by way of plans and feasibility schemes. The representative of the Bank is coming here next month and this matter will be discussed with him.

I realise the importance of Government maintaining close liaison with the industry. I am glad that the industry has formed themselves into an association. You are all aware that the Food Department has constituted a Central Fruit Products Advisory Committee in which representatives of the Association are actively participating.

I have mentioned some of the issues connected with the development of the fruit and vegetable preservation industry and I am sure you will seriously consider and take active steps for improving the situation to the extent possible.

VARIETAL SUITABILITY OF MANGOES FROM UTTAR PRADESH FOR CANNING

K. L. KAPUR

(Govt. Fruit Preservation and Canning Institute, Lucknow)

Mango, owing to its dessert qualities, is being canned both as slices and pulp. Quality of the raw material, steps in processing and conditions in storage and transit are of vital importance in the canning of mangoes. Dhopeswarkar and Magar (1954) reported that there was loss of vitamins during canning and further observed (1955) that high temperatures affected the shelf-life of canned fruits. Siddappa and Bhatia (1956) recorded that ascorbic acid and carotenoids were retained during canning, while Bose and Das (1958) reported carotenoids losses in canning and storage.

In view of paucity of information on the changes occurring during the process of canning of mangoes, studies were taken up to record (1) the chemical changes in fruits during the process of canning and (2) the effect of storage temperature on the quality and shelf-life of canned mango slices and pulp.

Material and Methods

The trial was carried out at Govt. Fruit Preservation and Canning Institute, Lucknow. Fruits of canning ripe maturity and uniform size were collected from Ideal Nursery, Lucknow. On arrival at the laboratory, the fruits were washed, peeled and cut into slices. During preparation, fruits remained dipped in 2 per cent salt solution. Slices were washed and filled in 1 lb. butter cans. Cans were filled with hot syrup of 40° Brix, leaving

$\frac{1}{4}$ " head space. The cans were exhausted till the centre of the can obtained a temperature of 82°C and were immediately sealed. The cans were subsequently sterilized for 15 minutes at 100°C and immediately cooled. For canning of pulp, the fruits were washed, peeled, pulp extracted and strained through stainless sieve. Fruit pulp was heated at 100°C and filled in 1 lb. jam cans and sealed immediately. Cans were sterilized at 100°C for 12 minutes and cooled rapidly.

For observation on changes in the process of canning, samples were drawn at each step i.e., fresh, after preparation, syruing and exhausting and sterilization and cooling. These were analysed for acidity, sugars and ascorbic acid. For study of the samples under storage, the cans were stored at room temperature, 37°C and 55°C. The sampling was commenced after a period of two weeks and subsequent samples were drawn at four weeks interval till 30th week. The samples were analysed for total soluble solids, acidity, sugars and ascorbic acid (A.O. A.C., 1960).

Results and Discussion

A. Changes in chemical constituents of mangoes during canning:

Acidity:

The acidity in the fresh ripe fruits was 0.36 per cent in *Dasheri* and 0.34 per cent in *Samar Bahisht* varieties respectively. It was observed that there was a gradual

Anders is active in the process of creating links in steel and pulp. The overall turnover in value rose 38% and 47.3 per cent, and 38.5 and 29.5 per cent, in steel and pulp, as well as in Anders and Anders Anders received respectively. This is all due partially due to the fact that the value added and in value and in amount of it being involved in production of paper and machine with the use of the company. (Table 1).

2000

The total value of outgoing remittances to the United States was 1.62 per cent and 1.56 per cent in Canada and Mexico. Mexico received approximately 1.56 per cent of the total value of outgoing remittances, while Canada received 1.62 per cent. The total value of outgoing remittances to the United States was 1.62 per cent and 1.56 per cent in Canada and Mexico. Mexico received approximately 1.56 per cent of the total value of outgoing remittances, while Canada received 1.62 per cent.

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Figure 1. Changes in observed concentrations of heavy metals during storm.

[illegible]

radual increase of 11.3 and 17.1 per cent during exhausting and 25.4 and 21.4 per cent during sterilization. In canning pulp the increase was 2.1 and 9.8 per cent in heating and filling and 24.4 and 2 per cent during sterilization in the two varieties respectively. Changes in reducing sugars were on account of solubilization of the soluble solids in the solid and liquid phases, whereas in canning pulp the increase was due to the partial concentration involved in hot filling and sterilization (Cruss, 1948).

Ascorbic acid:

The ascorbic acid content in the fresh fruit was 19.4 and 91.4 mg/100 g in *Dasheri* and *Samar Bahasht* varieties respectively. In canning as slices, there was a loss of ascorbic acid to the extent of 1.2 and 16.3 per cent during preparation, and 2.9 per cent during filling and heating and 39.5 and 12.7 per cent during sterilization in *Dasheri* and *Samar Bahasht* varieties, while in canning as pulp, the losses were of the order of 14.3 and 10.0 per cent during preparation, and 9.3 per cent during heating and filling and 38.5 and 36.5 per cent during sterilization in the two varieties (Table 1). Losses of ascorbic acid were on account of its being heat labile and oxidation involved during preparation, exhausting and canning.

Changes in canned mango slices and pulp during storage

Changes in chemical constituents such as total soluble solids, acidity, sugars and ascorbic acid contents in canned mangoes during storage at various temperatures are presented graphically (Figs. 1-3).

Total soluble solids:

Total soluble solids in the canned mangoes initially were *Dasheri* (26.4),

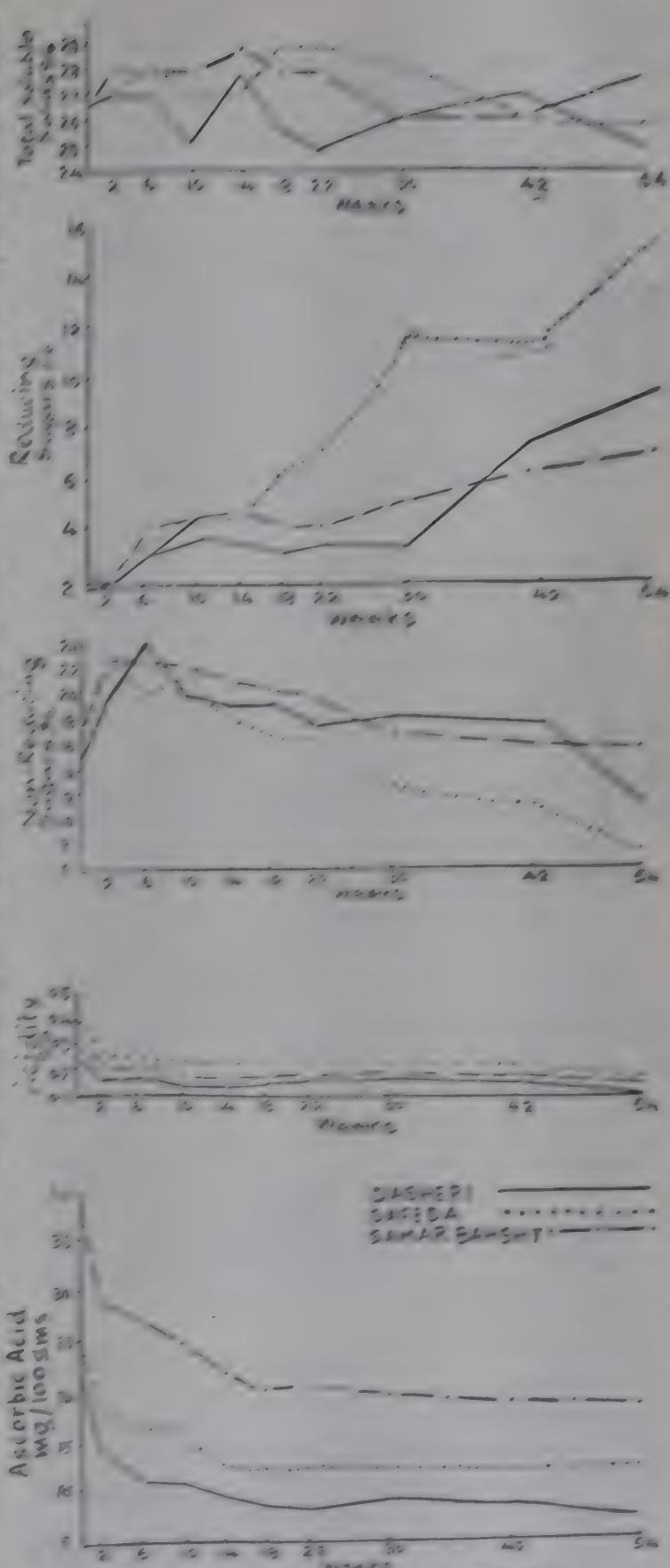


Fig-1 Changes in Canned Mango Slices at Room Temperature

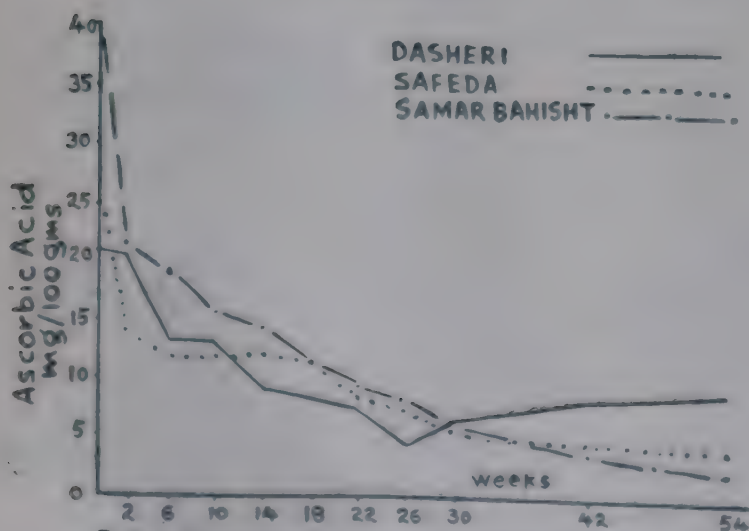
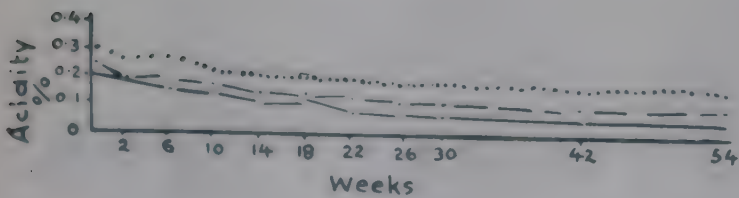
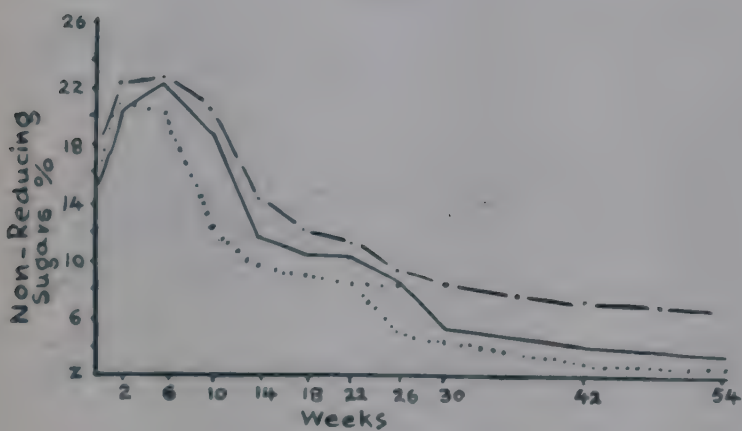
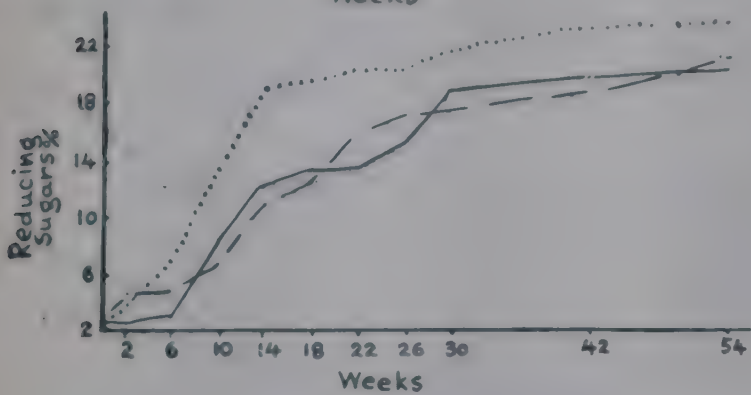
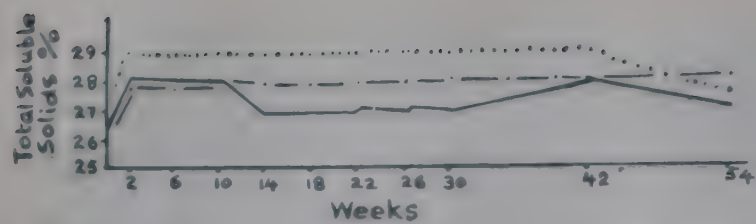


Fig 2 Changes in Canned Mango Slices at 37°C

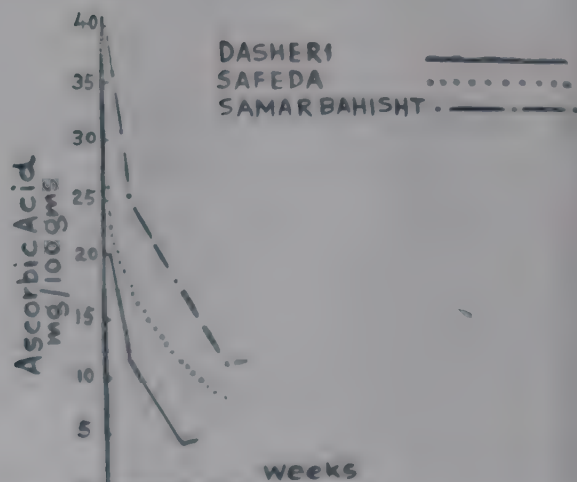
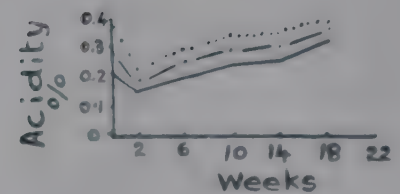
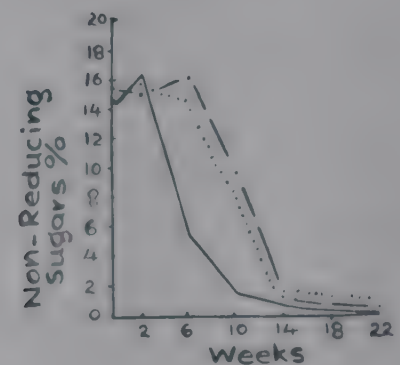
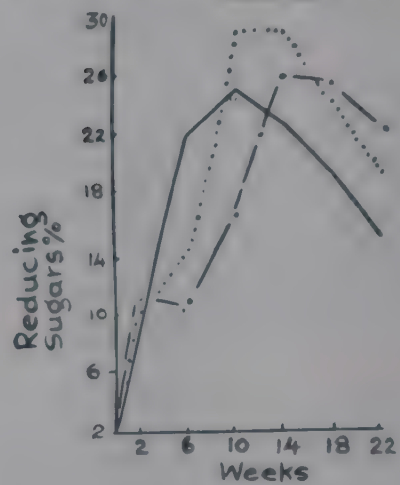


Fig 3 Changes in Canned Mango Slices at

Safeda (27.0) and *Samar Bahisht* (26.0) per cent respectively. There was no change in total soluble solids in various cut-out samples of canned mango slices in any of the three varieties and at the three storage temperatures. The slight variation in the results may be attributed to the operational differences involved in canning.

Acidity:

Acidity, initially in the canned fruits, was *Dasheri* (0.23), *Safeda* (0.39), and *Samar Bahisht* (0.29) per cent respectively. During the first two weeks of storage, the fruit acid tended to equalize further between the solid and liquid phases. During subsequent storage there was a decline in values, the rate of decline varying with the storage. The samples at 55°C, after a period of six weeks, recorded a continuous rise in values. Amongst the three varieties, *Safeda* possessed the highest acidity, followed by *Samar Bahisht* and *Dasheri*. The decrease in acid value was on account of the acid being involved in reaction with sugars and tin surface. The rate of decline was more rapid at higher temperatures (Borgstrom, 1968).

Sugars:

Reducing sugars, at the start of the storage period, were *Dasheri* (2.19 per cent), *Safeda* (2.3 per cent) and *Samar Bahisht* (2.23 per cent), while non-reducing sugars were 16.90, 16.05 and 16.10 per cent in the three varieties respectively. During storage period, inversion of non-reducing sugars took place, resulting in an increase of reducing sugars accompanied by corresponding decrease in non-reducing sugars. The rate of inversion was more rapid at higher temperatures and in case of samples at 55°C the product acquired brown, caramelized colour and flavour (Wilson, 1928).

Ascorbic acid:

The ascorbic acid content of the canned mango slices was 20.76, 22.96 and 40.0 mg/100 g in *Dasheri*, *Safeda* and *Samar Bahisht* varieties respectively. There was a gradual loss of ascorbic acid in canned mango slices under storage. Loss of ascorbic acid was more rapid at higher temperatures of 37°C and 55°C. It appeared that increase in values of ascorbic acid was due to the presence of ferrous and stannous ions and other reductones (Meyer, 1966).

Organoleptic characters:

Changes in sugars, acid and ascorbic acid were accompanied by changes in quality factors and conditions of the container, which largely determined the shelf-life of the product. It was observed that such changes were more rapid at higher temperatures. In case of samples at room temperature, mango slices retained normal colour, flavour and taste even upto a period of 700 days, whereas deterioration in the quality characters occurred within 50-60 days at 37°C and 25-30 days at 55°C. The colour of the slices changed gradually from pleasant mango yellow to light brown and finally to deep brown colour, which may be on account of changes in sugars or ascorbic acid (Wilson, 1928 and Stadtman, 1948). Development of the brown colour in the slices was closely accompanied by the changes in flavour and taste which finally determined the shelf-life of the product (Stadtman, 1948).

Effect on tin container:

The inside tin surface of the container was largely affected by the acid of the fruit resulting in the formation of blue and violet colour feathering on the tin surface. It is followed by gradual dissolution of the tin in syrup, loss of vacuum and development of springer; soft and

hard swell in case of samples stored at higher temperatures. The results are quite in confirmation with that of Dhopeshwarkar and Magar (1955) who found that samples stored at room temperature did not undergo discolouration or develop off flavour, while fruits stored at higher temperatures formed hydrogen swell with discolouration and spoilage.

Summary

In an experiment conducted at Govt. Fruit Preservation and Canning Institute, Lucknow, to study the chemical changes occurring in mango fruits during canning and subsequent storage in cans, it was inferred that quality of the canned mango slices was largely dependent on the biochemical composition and maturity of the fruit. During canning, acid, sugars and ascorbic acid tended to equalize between the liquid and solid phases. Ascorbic acid being sensitive to oxidation and heat was largely affected. During the storage of cans, there was decrease in acidity, non-reducing sugars and ascorbic acid and an increase in reducing sugars. The rate of changes in chemical components was more rapid at higher temperatures and markedly affected the quality and shelf-life of the canned products.

Dasher and *Safeda* cultivars were found good for canning but *Samar Bahisht*, being fibrous, did not prove suitable.

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STUDIES ON INDIAN PICKLES—PART III. PHYSICO-CHEMICAL VARIATIONS DURING GROWTH OF MANGOES (*AMLET* VARIETY) AND STORAGE STUDIES OF PICKLES FROM THEM

M. V. SASTRY, (MRS) NAGARATHNA KRISHNAMURTHY AND
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Introduction

The earlier two papers in this series^{1,2} dealt with the preparation of mango pickles of different varieties based on their acid content and the growth studies of sweet green mangoes (low acid variety). Very scanty published information is available where acid variety³ has been used for brining and pickling. No published information is available about the harvesting studies on acid variety mangoes, for determining the optimum stage of maturity for pickling purposes. The present paper deals with the growth studies of typical acid variety of mangoes namely *Amlet* variety.

Materials and Methods

From Kotehundi gardens in Mysore region, eight convenient trees of same age and growth were chosen out of the total eighteen trees of *Amlet* variety. The trees were full with blossom during the middle of February. After 3 to 4 weeks when fruits were of measurable size, hundred fruits each, from three trees, fifty fruits each from three more trees and another fifty each from last two trees were labelled to observe their growth studies.

Every week the orchard was visited to measure the length, breadth and flat side of the labelled fruits.

The measurements were taken at regular intervals for nine weeks, after labelling.

Unlabelled fruits were harvested for analysis commencing from the day of labelling. Measurements of the labelled fruits were done only for nine weeks because no labelled fruits, after this, were available due to the onset of monsoon. Physico-chemical analyses were conducted for thirteen weeks with the fruits available on the trees.

Cumulative percentage of fruit drop from each tree and the average has been calculated by collecting dropped labelled fruits during each week. About 50-100 fruits (unlabelled) of almost the same age and size were harvested every week and were brought to the laboratory for further observations and analysis. Length, breadth and flat side measurements of about twenty fruits from the harvested fruits and the weight of the same were noted.

Peel, flesh, kernel and shell were separated from the fruits and were weighed individually to calculate flesh, peel, kernel ratio in the growing fruits.

Moisture, sugars, acidity and vitamin C were done separately in peel, flesh and kernel of 20-25 fruits in triplicate as they were done in the earlier series of this paper^{1,2}. Rate of respiration and percentage of physiological losses in weight (PLW) were determined in quadruplicate².

To determine the optimum stage of maturity for pickle processing, a few bottles of pickles were prepared at each harvest.

Programme of analysis of pickles during storage for an year

Pickling date	I*	II*	III*	IV*
23-3-70	92	102	132	302
30-3-70	65	95	125	295
5-4-70	58	88	118	288
13-4-70	51	81	111	281
20-4-70	44	74	104	274
28-4-70	37	67	97	267
4-5-70	30	60	90	260
11-5-70	23	53	83	253
17-5-70	16	46	76	246
25-5-70	...	39	69	239

* Passage of number of days during the respective four stages of storage periods.

The method of preparation and the collection of raw materials were the same as it was given in the earlier paper². During the first three weeks the whole mangoes were pickled because of their smaller size. At later stages, they were cut, kernels were removed and pickled.

At frequent intervals, pickles with mangoes of different stages of maturity were analysed four times for their drained weight, moisture, salt, acidity and pH both in gravy and fruit pieces separately. Peroxide value and free fatty acids¹ were determined in the added oil. The prepared pickles were also evaluated organoleptically.

Results and Discussion

Growth and storage studies of developing raw mangoes

Figure 1 shows the variation in fruit drop among trees of the same orchard. Fruit drop was very heavy up to five weeks after labelling (Fig. 2). Then it slackened to a negligible quantity. A slight increase in the end was registered due to heavy winds and onset of monsoon. Yield of the fruit varied from 10 per cent to 34 per cent between trees with an orchard average of 16 per cent.

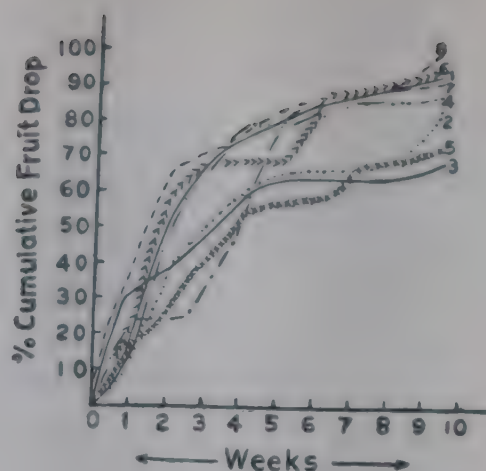


FIG. 1

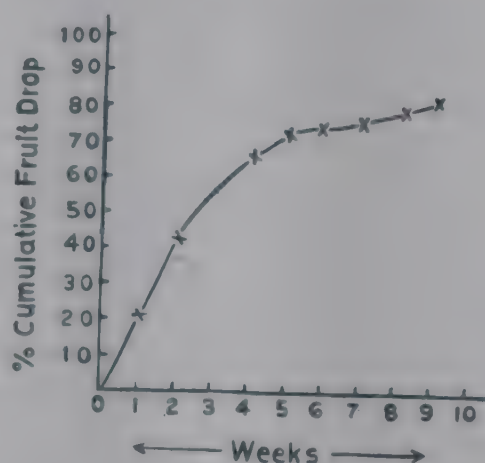


FIG. 2

Length, breadth, flat side and weight of the growing fruit were shown in the Figure 3. With regard to physical appearance *Amlet* has an oval shape which can be seen by the predominance of length over breadth and flat sides. During growth the increase per week in length was about one and half to two times to breadth and flat side. The life of the growing fruit could be divided into well defined stages as (1) enlarging stage, which comprised up to eight weeks growth showing rapid growth in size as well as in weight, (2) stage of early maturity, which comprised of eighth to tenth week, (3) mature stage, which comprised of tenth to twelfth week, and (4) finally the stage of advanced maturity, which comprised of twelfth and thirteenth week.

It could further be seen that the demarcation of the life of the fruit on the tree into these four stages is the outcome of the following physico-chemical observations

which were made during the growth of the fruit. Further, the observations helped us to arrive at an optimum stage to harvest the fruits for pickling purposes.

During early stage of enlargement, the fruit tastes predominantly astringent with thick green peel and slightly greenish flesh. As the fruit developed from enlarging to early maturity, it tasted astringently acidic with green peel and white flesh. At this stage the kernel also grew rapidly and shell formation took place, but it was very soft.

From tables 1 and 2, characteristic chemical changes during this enlarging stage could be seen. Qualitatively peel tended to decrease while flesh increased. Kernel increased during this period while shell fluctuated due to difficulty to separate and demarcate it. Moisture increased

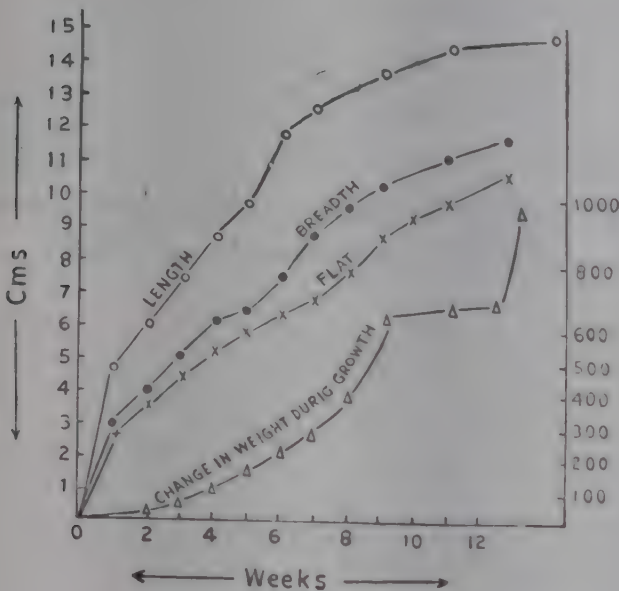


FIG. 3

TABLE 1. Physico-chemical variations at different stages in Amllet mangoes (Kotchundi)

Harvested Date	Stage No.	Percentage Ratio				Percentage moisture			Percentage total reducing sugars			Percentage acidity			Ascorbic acid mg/100 grams		
		F	P	K	S	F	P	K	F	P	K	F	P	K	F	P	K
3-3-70	1	57.0	31.6	2.3	9.1	81.4	65.7	80.7	1.0	0.96	...	3.0	2.1	...	...	350	In total fruit
10-3-70	2	71.0	22.7	3.1	3.2	86.1	74.2	85.2	0.91	1.2	2.1	3.6	2.4	2.1	...	250	
16-3-70	3	71.0	21.0	3.6	4.4	87.4	67.2	84.0	0.90	1.4	3.7	3.7	2.5	1.5	...	218	
23-3-70	4	75.7	17.0	3.0	5.6	88.6	69.5	84.8	1.0	1.9	3.9	3.9	2.2	1.4	...	225	
30-3-70	5	78.7	15.3	5.0	1.0	88.5	70.3	84.5	1.0	0.95	2.5	3.1	1.9	1.6	...	192	
5-4-70	6	78.4	13.5	4.0	4.1	89.0	71.2	83.8	0.88	0.90	2.8	3.2	1.4	1.4	217	126	27
13-4-70	7	84.7	9.5	7.3	0.5	89.8	71.6	83.3	0.96	1.36	2.6	3.26	1.34	1.43	172	112	24
20-4-70	8	76.0	15.2	8.3	0.5	89.5	71.2	83.3	1.26	1.88	3.3	3.25	0.90	1.70	158	188	24
28-4-70	9	80.0	7.2	9.3	3.5	90.3	72.0	72.1	1.80	2.70	3.5	3.20	1.01	1.63	85	152	31
4-5-70	10	85.7	7.9	5.8	1.6	88.0	72.6	76.4	1.81	2.70	4.62	3.20	0.94	1.33	75	190	35
11-5-70	11	84.1	6.4	3.1	6.4	90.3	73.0	75.8	2.28	2.52	4.50	3.10	1.30	1.38	68	150	22
17-5-70	12	80.2	7.2	3.7	6.6	89.8	73.2	75.0	2.36	2.76	4.87	3.10	1.25	1.31	67	148	36
25-5-70	13	88.7	8.1	3.1	5.1	90.5	73.2	75.6	2.47	2.13	5.16	3.52	0.91	0.96	63	208	22

Acidity—w/w % as anhydrous citric acid
Reducing sugars were not present in the sample

Flesh—F
Kernel—K
Peel—P
Shell—S

TABLE 2. *Physico-chemical composition of*

Sl. No.	Date of Harvest	Measurements in cm			Average weight of one fruit in g	pH	°Brix	Percentage ratio of			
		L	B	F				P	F	K	S
1.	1-4-1971	10.5	8.01	6.4	439	2.6	9.3	18.1	76.1	5.8	nil
2.	22-4-1971	11.52	8.93	7.90	643	2.8	9.3	11.0	76.4	4.2	9.4
3.	27-5-1971	13.4	11.5	10.8	872	3.0	9.3	5.5	85.3	2.9	6.3

L=Length B=Breadth F=Flat P=Peel F=Flesh K=Kernel S=Shell

slowly tending towards constancy in peel, flesh and kernel towards the end of this stage. Sugars started forming during this period while acidity was almost constant. Ascorbic acid was maximum in the beginning of this stage while it fell to half by the end of this stage.

During the stage of early maturity, the mango reached almost maximum size and weight. Growth rate retarded very much. The colour of the fruit was green with white flesh under the thin green peel. Stone, which already formed, was hardening but the shell was sufficiently soft to be cut by ordinary knife. Flesh portion showed slight increase while peel became less and kernel was maintained at higher value. Moisture per cent in flesh, peel and kernel was sufficiently high while it was decreasing in kernel than the previous stage. Percentage of total reducing sugars continued to accumulate into flesh, peel and kernel of the fruit. Acidity continued to be constant in flesh while it showed slight decrease in peel and kernel. Ascorbic acid was generally decreasing. It fell to half in flesh during this stage while the decrease was gradual in peel and it was the lowest in kernel. Respiration rate, which was the highest in the early stage of enlarging fruits, touched the lower value by four weeks of age. It was almost constant towards the end of enlarging period (Fig. 4). Fruits stored

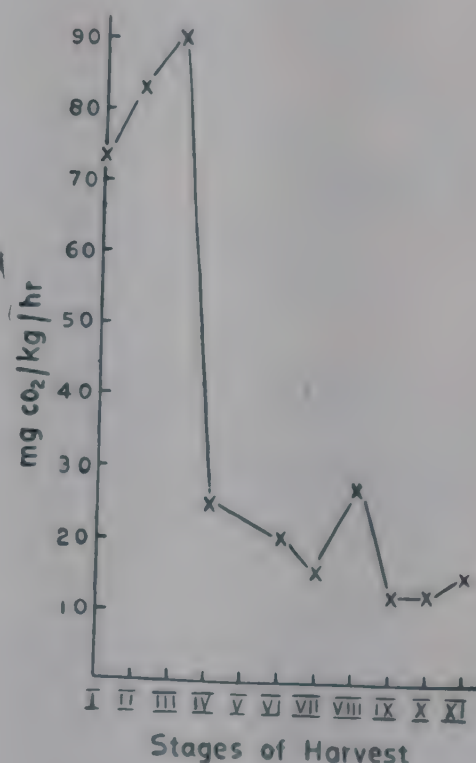


FIG. 4

during enlarging period fluctuate very much in their respiration rate (Fig. 4a and 4b). Physiological loss in weight (PLW) was more in the early weeks of fruit growth while it tended towards a lower constant figure later during early maturity. Fruits were retained for longer period in storage during this period.

Pickle prepared from fruits during this stage was good in colour, texture and taste with the predominant raw mango flavour. Mangoes of early maturity (8 to 10 weeks) were found to be excellent in all respects

Moisture %			Acidity %			Vitamin C mg/100 g			Sugars %	R.S.
P	F	K	P	F	K	P	F	K	T.R.S.	
74.0	88.5	82.5	1.3	3.3	1.7	234	144	36	42	1.8
69.3	87.2	65.9	2.4	3.2	1.7	105	45	nil	4.4	1.8
67.0	83.0	70.0	1.3	3.3	1.7	122	45	nil	4.6	2.0

T.R.S.=Total reducing sugars

R.S.=Reducing sugars.

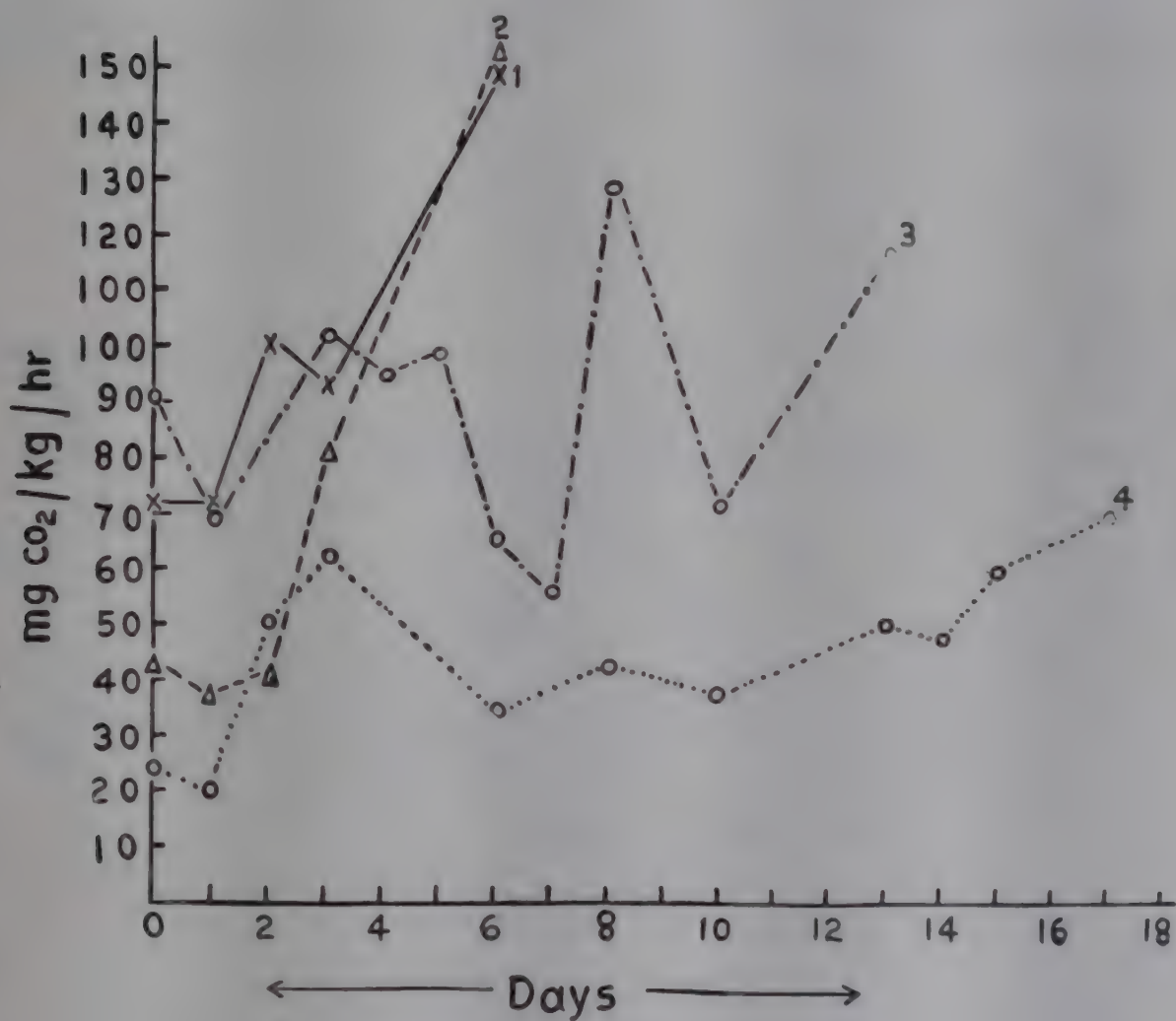


FIG. 4a

(Table 5) for the preparation and storage of pickles.

Fruits of mature stage were almost constant in their size and weight. Peel was of lighter green in colour with flesh tending towards light yellow colour. Stone

was hard and difficult to be cut with ordinary knife. Characteristic raw mango flavour was absent at this stage with slight development of fruity odour. Flesh portion increased than in earlier stages. Peel was constant, with shell portion

touching the maximum. Kernel formed lower percentage but was constant. Moisture was constant in flesh, peel and kernel. Total reducing sugars reached maximum value with kernel predominating over peel and flesh. Flesh contained more acid than peel and kernel. Thus, this variety was predominantly sour in taste even in mature and advanced mature stages unlike other table varieties of mangoes. This stage was found unsuitable for pickling because it developed fruity odour in place of characteristic raw mango flavour of the previous stage, with colour of the flesh tending towards yellowish

tinge during this stage. Ascorbic acid was constant during this stage touching the lowest value in flesh, peel and kernel. Respiratory activity was the lowest and tended towards constant value (Fig. 4). Physiological loss in weight (PLW) was lower during this period but the storage period was shorter than the previous stage. It ripened after four to five days storage after harvesting it at this stage.

During advanced maturity (fruits of 12 and 13 weeks old), peel developed yellow patches with flesh inside becoming yellowish. Stone was the hardest in texture. Part of the fruit became soft with

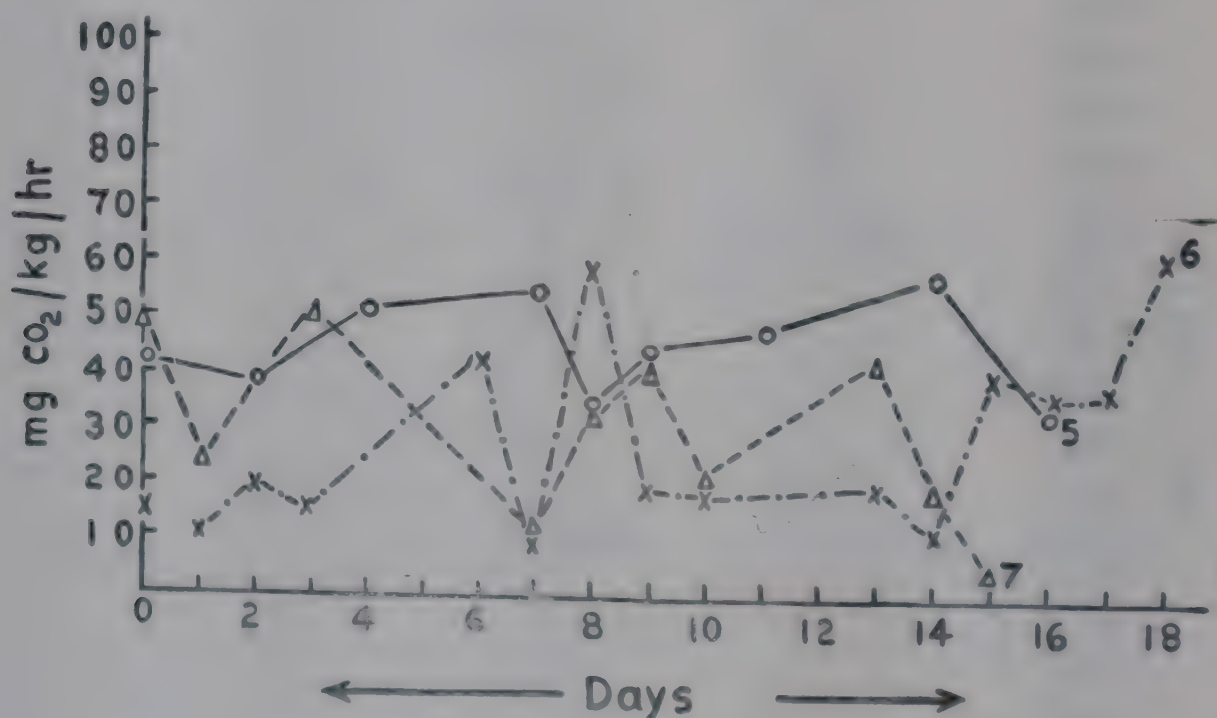


FIG. 4b

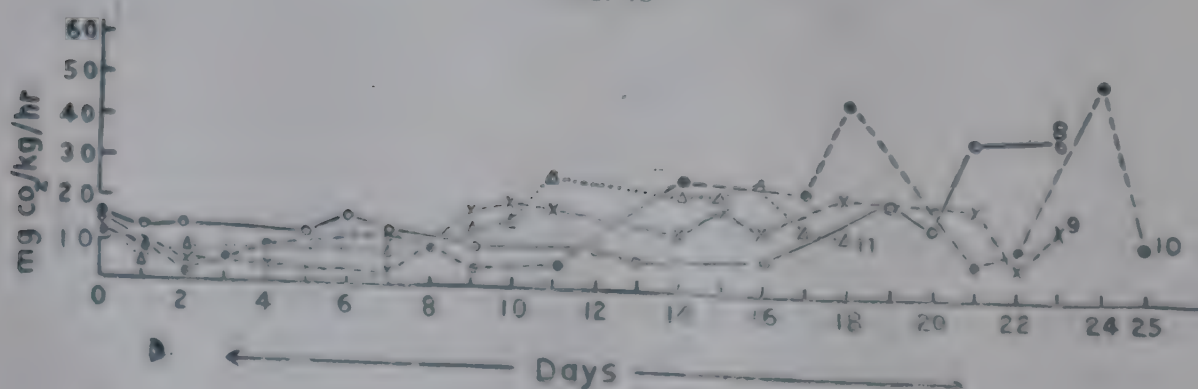


FIG. 4c

TABLE 3. *Physico-chemical composition of the prepared pickles*

Sl. No.	Age of pickle (days)	Drained wt.	Moisture		pH		Salt		Acidity		FFA	PV
			G	F	G	F	G	F	G	F		
1.	93	...	...	...	...	...	...	...	...	...	...	...
2.	86	...	...	...	...	...	...	...	...	...	...	...
3.	79	...	...	...	...	...	...	...	...	...	...	...
4.	72	64.6	39.5	68.0	3.15	3.70	12.35	16.90	1.75	2.05	1.76	0.97
5.	65	61.5	35.8	71.3	3.2	3.8	10.35	16.10	1.66	1.78	1.76	0
6.	58	61.7	42.9	71.3	3.2	3.8	12.84	14.29	1.32	1.67	1.56	0.97
7.	51	66.2	45.5	73.7	3.1	3.7	13.27	14.09	1.83	2.02	1.85	1.74
8.	44	64.6	49.8	71.3	3.05	3.7	13.29	14.68	2.18	1.82	0.51	1.47
9.	37	62.2	49.0	71.0	3.15	3.5	13.85	14.60	2.04	1.64	0.58	2.14
10.	30	70.0	49.0	72.9	3.0	3.75	13.33	13.49	2.41	1.88	1.07	2.15
11.	23	63.9	47.6	69.6	3.15	3.55	13.66	16.18	2.40	1.82	0.49	2.61
12.	16	65.8	48.6	68.3	3.1	3.6	10.50	15.35	2.25	1.38	0.19	1.7

G=Gravy F=Fruit pieces FFA=Free Fatty Acids PV=Peroxide Value

TABLE 4. *Physico-chemical composition of prepared pickles*

Sl. No.	Age of pickle (days)	Drained wt.	Moisture		pH		Salt		Acidity		FFA	PV
			G	F	G	F	G	F	G	F		
1.	123	65.4	39.82	55.95	3.8	3.9	16.1	15.22	1.18	3.7	no oil	...
2.	116	55.0	33.77	49.18	3.75	3.8	19.45	14.30	1.5	3.6	no oil	...
3.	109	54.5	33.97	49.89	3.9	3.8	19.1	13.65	0.92	3.8	no oil	...
4.	102	63.2	57.47	61.72	3.3	3.5	13.5	17.15	1.5	1.4	1.29	7.03
5.	95	60.0	33.82	66.79	3.4	3.5	10.15	17.3	1.3	1.5	1.36	8.5
6.	88	58.0	34.34	62.81	3.3	3.6	11.0	16.44	1.45	3.25	1.75	14.39
7.	82	58.4	36.33	66.66	3.2	3.4	12.7	17.25	1.9	1.95	1.03	18.79
8.	74	59.4	49.53	64.13	3.2	3.5	14.4	16.4	1.95	2.0	0.59	9.8
9.	67	60.8	51.35	64.18	3.2	3.4	16.5	18.4	2.4	1.9	1.21	9.7
10.	60	67.0	54.91	67.02	3.2	3.5	13.1	16.0	1.7	2.19	0.53	7.3
11.	53	60.1	51.60	63.01	3.15	3.2	14.55	18.5	2.23	2.15	0.45	12.62
12.	46	60.3	50.29	63.3	3.15	3.4	15.25	18.6	2.13	2.3	1.03	2.18
13.	39	66.1	40.05	62.99	3.1	3.15	14.7	18.6	2.28	2.21	0.55	10.19

G=Gravy F=Fruit pieces FFA=Free Fatty Acids PV=Peroxide Value

TABLE 5. *Physico-chemical composition of prepared pickles*

Sl. No.	Age of pickle (days)	Drained wt.	Moisture		pH		Salt		Acidity	
			G	F	G	F	G	F	G	F
1.	153	45.0	30.77	51.25	3.8	3.8	20.0	16.8	1.12	3.48
2.	146	35.6	...	...	3.8	3.8	...	...	...	...
3.	139	39.2	40.7	49.4	3.9	3.8	20.6	13.3	0.95	4.13
4.	132	62.8	46.6	62.7	3.4	3.5	14.5	17.4	1.66	2.17
5.	125	60.2	42.2	63.6	3.4	3.5	...	...	...	...
6.	118	55.0	48.9	63.0	3.4	3.5	14.2	17.5	1.8	1.82
7.	111	54.0	52.6	65.0	3.1	3.3	14.0	17.7	1.9	2.06
8.	104	56.8	54.8	64.3	3.1	3.2	...	...	...	...
9.	90	64.7	50.3	63.6	3.1	3.3	15.9	18.6	1.98	2.15
10.	83	57.7	52.8	64.2	3.1	3.3	15.1	18.0	2.25	2.44
11.	76	47.2	48.8	51.9	3.1	3.2	15.3	17.6	2.22	2.36
12.	69	43.4	52.04	53.5	3.1	3.2	16.5	17.9	2.16	2.33

G=Gravy

F=Fruit pieces

deep yellow flesh, whereas the other part of the fruit was light yellow in colour with definite acidic taste. Unlike other table varieties this variety did not taste sweeter even at this advanced stage of maturity due to dominance of acidity in flesh. The size and weight of an average fruit was constant. In many cases the fruits were attacked by weevils and fell from the tree becoming soft, and mealy. Total reducing sugars were maximum at this stage, still the fruit tasted dominantly acidic with a pH of 2.8-3.0 (Table 2) in the pressed juice of the flesh. However, the fruits could not be allowed to grow to this stage on the tree because of strong winds and due to the onset of monsoon. There was not much change in respiratory activity during this stage when compared to the previous stage. PLW was constant and low but storage period was almost negligible. This stage was not use-

ful for pickling because this lacked not only characteristic raw mango flavour but also the texture of the fruit was soft to stand any storage.

In the following year, *Amlet* mangoes from K.R.S. Nursery were harvested at enlarging stage (1.4.71), early maturity (22.4.71) and advanced stages (27.5.71) of maturity. The data were presented in Table 2. This crop reached the advanced period of enlarging stage by 1.4.71. Active growth in size and weight did almost cease by this time. Early maturity was commenced by 22.4.71 while 27.5.71 was the advance stage of maturity. Peel, flesh and kernel ratios showed the same trend as that of the Kotehundi variety. Moisture decreased in peel and kernel while it increased in flesh during the growth as in the previous case. Acidity also followed the similar trend as Kotehundi variety of *Amlet* mangoes. Ascorbic acid

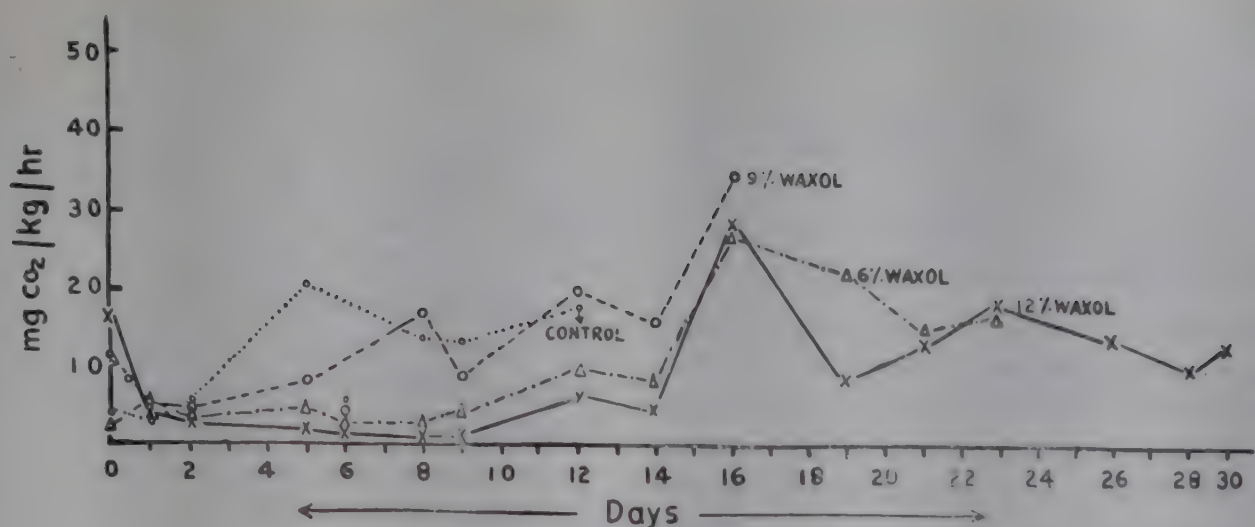


FIG. 5

TABLE 6. Physico-chemical composition of the prepared pickles

Stage No.	Age of pickle (days)	Drained weight%	Moisture%		Acidity% w/w as anhydrous citric acid		Salt%		pH		General Remarks
			Gravy	Fruit	Gravy	Fruit	Gravy	Fruit	Gravy	Fruit	
1.	323	40.0	30.8	52.2	1.2	3.0	20.2	16.0	3.5	3.5	Fruits shrivelled, leathery
2.	309	35.0	29.3	55.5	1.2	3.0	20.2	15.0	3.5	3.5	Had saltish, astringent taste, not good for pickling.
3.	302	38.0	48.0	63.0	1.05	3.5	15.0	17.2	3.5	3.5	"
4.	295	63.0	42.8	63.0	1.7	2.0	15.0	17.1	3.1	3.2	Fair, lacks in characteristic mango flavour, fruit pieces texture feel rather hard.
5.	288	60.0	50.4	62.0	1.7	2.1	15.0	17.1	3.1	3.2	"
6.	281	55.0	52.3	64.2	1.80	1.82	14.0	17.3	3.1	3.2	Good, mango pickle taste.
7.	274	54.0	52.0	65.0	1.90	2.10	14.4	17.5	3.1	3.2	"
8.	267	57.0	50.0	65.4	1.88	2.20	15.9	16.4	3.1	3.2	Excellent, transparent texture, bright yellow with good flavour.
9.	260	62.3	50.3	63.0	1.86	2.21	15.6	17.4	3.1	3.2	"
10.	253	56.0	54.3	63.6	2.0	2.52	15.7	17.1	3.1	3.2	Good, flavour is not so good.
11.	246	37.0	57.5	52.5	2.25	2.43	14.1	14.1	3.1	3.2	Rather fair, few pieces were soft, with fruity flavour.
12.	239	33.0	53.8	52.8	2.02	2.21	14.9	15.8	3.1	3.2	Poor, very soft and massy.

1. *Phragmites*

Table 7. Rate of improvement by 174/180 of children in group B.

Block No. with date of harvest	1	2	3	4	5	6	7	8	9	10
1. Harvested on 10-1-58	75.4	55	823	953	—	—	10.4	11	—	—
2. Harvested on 10-1-58	81.4	828	4.3	81.46	—	—	10.4	11	—	—
3. Harvested on 10-1-58	80.7	46.5	—	80.27	80.47	80.4	10.38	11.2	10.5	10.1
4. Harvested on 10-1-58	79.6	38.1	51.86	42.1	—	—	10.38	—	10.37	—
5. Harvested on 1-4-58	21.4	—	27.6	—	25.28	—	—	10.2	10.1	10.28
6. Harvested on 2-4-58	21.4	24.7	—	21.48	—	—	10.38	10.37	10.38	10.4
7. Harvested on 3-4-58	21.5	10.7	81.2	81.2	—	—	10.5	10.7	10.27	10.78
8. Harvested on 3-4-58	21.5	10.25	81.8	—	—	10.48	10.3	11.4	—	10.1
9. Harvested on 4-1-58	11.5	11	11.5	10.5	11	—	—	11.5	11.5	11.4
10. Harvested on 11-1-58	11.5	11	11.5	10.5	11	—	—	11.5	11.5	11.4
11. Harvested on 11-1-58	11.5	11	11.5	—	11.5	—	—	11	10.28	10.2

added. During ageing the texture of the fruit became leathery. The gravity increased with time (tables 4-6). Age of the fruit was also observed. Taste of the fruit was more satisfactory. There was no microbial growth during storage of these pickles compared to early growth. It remains to be seen the reason for this. Generally, it is said that this stage is too early for pickling, although there is a practice of pickling (Vadumango) pickle with these fruits of early growth, in some parts of the country.

Tables 3 and 4 show the changes during storage of the pickles in moisture, drained weight, pH, salt and free fatty acids and

peroxide value of these pickles during storage.

After processing, ageing of the pickle is essential to have a constant equilibrium of the various ingredients like salt-water blend, drained weight, yield colour, texture and flavour between the gravy and the fruit pieces to give an overall effect of an attractive mango pickle. After ageing, the analytical constituents like drained weight, moisture, salt, acid and pH should remain constant in the pickle during storage.

Drained Weight

In the pickle prepared out of mangoes of 4 weeks age, the distribution of various

Stages of fruit growth and development (1979 crop from Kutchikan)

11	14	15	16	17	18	19	20	21	22	23	24	25
...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...
118.2	Discarded	...	...	...	...	...	...	...	...	...	...	...
30.31	47.98	60.4	...	70.25	...	...	Discarded	...	...	...	...	...
...	56.7	...	12.59	Discarded	...	...	...	...	...	...	...	...
20.22	10.89	39.86	31.56	36.78	...	...	61.7	Discarded	...	...	...	...
42.35	19.57	5.5	...	Discarded	...	...	...	...	...	...	...	...
7.49	...	8.81	...	...	22.61	17.06	38.37	...	38.59	...	...	Discarded
...	13.73	29.56	11.05	...	23.78	...	...	11.81	8.24	18.51	Discarded	...
...	28.74	20.82	15.78	24.98	49.24	...	...	9.24	13.24	32.78	53.84	14.49
...	24.82	24.91	17.45	16.32	15.51	...	...	Discarded	...	...	...	...

TABLE 5. Cumulative percentages of physiological losses in weight (P.L.W.)

(Initial wt. = 5 g)

Batch No. with date of harvest	Days after harvest											
	1	2	3	4	5	6	7	8	9	10	11	12
One week old Batch I Harvested on 18-3-70	1.94	12.25	33.58	---	---	41.84	Discarded	---	---	---	---	---
Two week old Batch II Harvested on 18-3-70	16.21	19.71	23.21	---	---	33.43	Discarded	---	---	---	---	---
III. Harvested on 18-3-70	4.71	9.3	14.43	---	---	---	30.65	31.83	36.23	37.94	41.54	44.81
IV. Harvested on 13-3-70	3.13	..	9.57	13.06	15.63	17.58	19.33	21.7	22.96	24.35	---	---
V. Harvested on 3-4-70	3.13	5.17	6.34	---	---	11.0	---	13.09	---	15.06	---	---
VI. Harvested on 3-4-70	---	3.94	---	8.36	---	---	14.05	15.82	17.81	---	28.82	---
VII. Harvested on 13-4-70	2.45	---	5.44	---	---	10.16	11.19	11.91	12.47	14.43	---	---
VIII. Harvested on 19-4-70	1.51	3.19	4.38	---	---	7.74	8.57	9.54	10.5	11.65	---	---
IX. Harvested on 19-4-70	0.96	2.54	---	---	4.53	5.47	6.2	---	7.75	---	---	8.73
X. Harvested on 4-5-70	0.71	1.49	2.39	3.39	---	---	4.7	5.6	5.98	6.85	7.30	---
XI. Harvested on 11-5-70	0.80	1.70	2.63	3.09	---	---	4.33	5.24	5.7	---	6.62	---
XII. Harvested on 18-5-70	0.64	1.39	---	2.64	---	---	4.08	4.75	5.21	5.59	6.27	---

ingredients between fruit and gravy did not reach equilibrium due to the non-carbidity of mangoes. The drained weight of the product changed from 64.6 per cent to 63 per cent even after 295 days of storage. During 5th week at the end of 283 days the change was from 62 per cent to 60 per cent. As the stage of maturity advanced migration of acid and salt took less time between fruit and gravy. It can be seen from the Fig. 6 that 6 per cent to 10 per cent difference in drained weight was obtained within 75 to 100 days, between pickles with sixth and tenth week

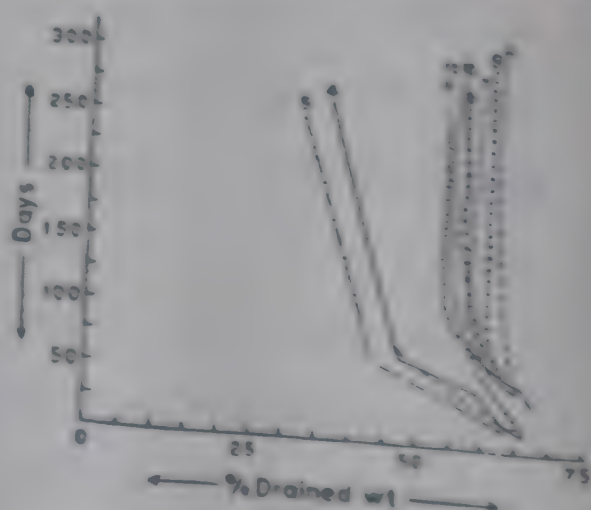


FIG. 6

INDIAN FOOD PACKER

arvest

13	14	15	16	17	18	19	20	21	22	23	24	25
...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...
Dis- carded	...	...	...	...	...	...	...	...	...	...	...	...
28.13	Dis- carded	...	...	...	...	...	...	...	...	...	...	...
18.66	19.86	21.49	...	23.57	...	...	Dis- carded	...	...	...	...	...
...	24.80	...	27.0	Dis- carded	...	...	...	...	...	...	...	...
16.09	16.76	17.43	18.35	19.23	...	...	20.7	Dis- carded	...	...	...	...
13.13	17.7	19.99	...	...	...	...	...	...	...	...	...	...
9.30	10.13	...	11.12	...	...	12.34	12.92	13.57	...	14.59	Dis- carded	...
...	8.51	10.03	10.81	...	11.69	...	...	12.63	13.41	13.67	Dis- carded	...
...	8.2	8.58	9.54	9.74	9.9 ^e	...	...	11.95	13.09	13.65	14.22	...
...	8.01	8.69	9.27	9.79	10.04	...	...	Dis- carded	...	...	...	...

XI batch Discarded after 25 days

of development of mangoes. After this period it remained more or less constant. The final drained weight of the product was more than 54 per cent in these cases. In the last two stages, the salt-acid distribution was very quick between fruit and brine perhaps due to over maturity. By the end of storage the percentage drained weight was about 35 per cent.

Moisture

Due to osmosis added ingredients form into a gravy which is highly relished part

of the pickle. With fruits of early stage (upto 5 weeks), gravy had a moisture content of about 40 per cent even after a long ageing of 120 days (tables 4 and 5). With pickles of mangoes of advanced stage of growth (with mangoes of 8 to 10 weeks age) the gravy was able to extract 50 per cent moisture within a month (Table 3). Afterwards it was almost constant at 50 to 52 per cent moisture level in the gravy of 8 to 10 week aged mango pickles. The initial moisture content in fruit pieces of the pickle ranged from

TABLE 9. *Rate of respiration (expressed as mg CO₂/kg/hr) of treated and*

Treatments	Days after						
	Initial	1	2	5	6	8	9
I. Treated with 12% Waxol W.	17.15	4.41	3.28	2.09	0.53	1.32	1.56
II. Treated with 9% Waxol W.	2.96	5.29	4.15	4.7	3.4	22.12	8.19
III. Treated with 6% Waxol W.	11.79	4.63	4.60	8.7	4.66	3.23	4.72
IV. Control	4.20	3.00	4.81	20.19	4.09	14.05	13.24

TABLE 10. *Cumulative percentage of physiological losses in weight (PLW) of treated and untreated Amlet mangoes during storage as Room Temperature (75-90°C)*

1970 crop of Kotehundi garden

Treatments	Days after storage														
	1	2	5	6	8	9	12	14	16	19	21	23	26	28	30
I. Treated with 12% Waxol W.	0	0.23	1.15	1.36	1.96	2.41	3.17	3.17	5.64	5.64	5.64	5.98	6.09	6.79	7.94
II. Treated with 9% Waxol W.	0.67	0.97	2.17	3.06	3.51	3.89	5.16	6.13	8.26	Dis- carded	...	...	...	...	...
III. Treated with 6% Waxol W.	0.52	0.52	2.29	2.61	3.61	3.87	4.51	5.54	7.09	7.35	8.38	9.03	Dis- carded	...	...
IV. Control	0.44	1.08	2.74	3.12	4.24	6.07	6.57	Dis- carded	...	...	...	...	...	...	...

70 per cent to 72 per cent for about one to two months (Table 3). During ageing it reduced to 63 per cent to 64 per cent. In the last two stages of pickles, both the fruit portion and the gravy had 50 to 53 per cent moisture content (Table 6) which indirectly indicates the softness of the fruit due to advanced maturity.

Acidity

The passage of acid to the gravy from the fruit took less time of 30 to 40 days to

reach equilibrium between fruit and gravy. At the initial stage gravy had about 1.8 per cent and fruit had about 2 per cent acidity (Table 3). From sixth week onwards the acidity in the fruit and gravy was almost same (2 per cent to 2.2 per cent) which was maintained for the whole of storage period.

Salt

Similar to the acid, salt distribution between gravy and fruit took less time to

storage

12	14	16	19	21	23	26	28	30
6.79	4.7	29.51	9.02	13.8	18.8	14.5	10.32	13.4
20.01	16.13	34.76	Discarded	...	...	...	...	...
10.1	8.72	28.12	22.9	15.1	18.1	Discarded	...	...
17.96	Discarded	...	...	...	...	...	...	...

reach an equilibrium of about 17 per cent in fruit pieces and 15 per cent in gravy.

pH: The change in pH was more or less same in all stages. Three weeks old mango pickles had pH of 3.5 (Table 6) whereas it was 3.1 to 3.2 in latter stages (Table 6). Equilibrium in pH between fruit and gravy was reached after about 100 days with almost all stages of mangoes.

Free fatty acids and peroxide values of oil in pickles

These were negligible. This shows the oil in the pickle was not rancid during about a storage period of one year.

Organoleptic evaluation showed that pickles with 6 to 10 weeks aged mangoes were good in all respects. Particularly pickles of 8 and 9 weeks old mangoes had a bright yellow colour with characteristic raw mango flavour and a transparent texture. Fruit pieces tasted slightly saltish but in combination with rice, the taste was good. In the early stages the fruit pieces of pickles were rather hard and were of no characteristic flavour (flat taste). During the last two weeks of growth the mango pieces of pickles were soft and mashy and had a fruity flavour which showed they were overmatured. It is clear from the

above points that 8 to 9 weeks old mangoes are the best for pickling. This proves that mangoes of early stage of maturity are better suitable for pickling from all points of view.

Summary

The physico-chemical characteristics and the processing of Amlet mangoes showed that the mangoes of early maturity are the best for pickling purposes.

Early stage of maturity of 8 to 9 weeks growth was taken as the optimum stage of maturity for pickling. At this time the length, breadth and flat side measured almost maximum and weighed about 650 g.

The yield varied from 10 per cent to 34 per cent among trees from the same orchard with an average of 16 per cent yield for the whole orchard.

The rate of respiration reached a peak (climacteric) when the fruits were 8 weeks old (harvested in the last week of April) marking the onset of maturation. Fruits harvested at this stage could be stored in good condition for a longer period. The PLW and physico-chemical observations also were correlated with these findings.

9 per cent and 12 per cent waxol treatment to the freshly harvested fruit enhanced the storage life by 18 days.

75 to 100 days were taken for the complete ageing of the pickle with fruits of optimum stage of maturity.

Good pickle at the proper stage of maturity had a moisture of about 50 per cent and 60 per cent in gravy and fruit pieces respectively. Mango pickles with fruits of early maturity gave a good product with shining yellow colour, transparent texture and good characteristic raw mango flavour.

Acknowledgement

The authors thank Dr H. A. B. Parpia, Director, and Dr B. L. Amila, Scientist-in-charge, for their keen interest and valuable suggestions.

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STUDIES ON INDIAN PICKLES—PART IV. PHYSICO-CHEMICAL VARIATIONS OF SOME IMPORTANT VARIETIES OF MANGOES

M. V. SASTRY AND (MRS) NAGARATHNA KRISHNAMURTHY

Commercial production of pickles is at present mostly concentrated in places like Bombay, Calcutta, Delhi, Amritsar, Panipat, Lucknow and Madras. However, the most important centre of production is Bombay. For Bombay factories receive almost all raw mango supply for pickling from traditional seedling mango growers of nearby Ratnagiri and Kolaba areas. Due to various reasons the area under mango groves is dwindling year by year. The cost of the raw mango is also increasing year by year and it is now registered ten times higher than it was earlier. This being the case in other places also it has become necessary to search for other economical and suitable varieties of mangoes for pickling purposes. In the light of the earlier investigations¹⁻³ the present study into physico-chemical characteristics of popular table varieties such as *Neelum*, *Totapuri*, *Banganapalli*, *Sakkaratti*, *Rasam* and *Maddur special* and seedling varieties from Sakkalli, Bogadi and Krishnaja Sagar gardens near Mysore city was taken up. Studies were done at the enlarging stage, early mature stage and advanced stage of maturity to determine the best period of harvest for pickling purposes. Growth studies of *Neelum* and *Totapuri* were also undertaken.

Materials and Methods

Most of the pickle varieties were from Sakkalli and Bogadi gardens. Table varieties were selected from Mandya Horticultural farm. *Amlet* mangoes were taken from KRS Nursery and Mandya.

Six trees of *Totapuri* and two trees of *Neelum* were selected for labelling purposes. Flowering and fruiting were occurring simultaneously in these two varieties. Labelling was done in the 1st week of March. Different sizes of fruits were labelled as it was difficult to get fruits of the same size. Every week till the last week of May the measurement of the fruits were taken. Cumulative percentage of fruit drop, the growth period and variations of the different sizes during growth period have been presented in figs. 1 to 5. The growth studies of these two varieties were also conducted in 1970.

In 1971, fruits from the above gardens were harvested at regular intervals for analysis. They were analysed for their measurements, weights, peel-fruit-kernel ratio, moisture acidity, sugars, pH, Brix and ascorbic acid. Table 1 gives the idea about the gardens, varieties and harvested dates. Methods followed for the above analyses were same as in the previous series of this papers¹⁻³.

Results and Discussion

The study of *Neelum* variety of mango reveals that a maximum period of six weeks will be taken from the date of labelling to reach simultaneously the full size and optimum stage of maturity of all fruits irrespective of their dissimilar sizes at the commencement.

Figures 1a and 1b show the initial and final measurements of different sizes during the growth period. These observations show that the fruits reached the maximum growth

TABLE 1

Sl. No.	Name of garden	Variety		Date of Harvest
		Table	Pickle	
1.	Govt. Horticulture Farm, Mandya	<i>Neelum</i>		1-4-71
		<i>Totapuri</i>		22-4-71
		<i>Sakkargutti</i>		22-4-71
		<i>Rasam</i>		7-5-71
		<i>Suvarnarekha</i>	<i>Suvarnarekha</i>	17-5-71
		<i>Maddur sp.</i>		17-5-71
2.	Sakkalli	nil	Sweet variety	6-4-71
3.	Sakkalli	"	Pickle variety (sour)	22-4-71
				7-5-71
4.	Bogadi	"	"	6-4-71
				27-4-71
				7-5-71
5.	KRS Nursery	"	<i>Amlet</i> (sour)	1-4-71
				22-4-71
				27-4-71

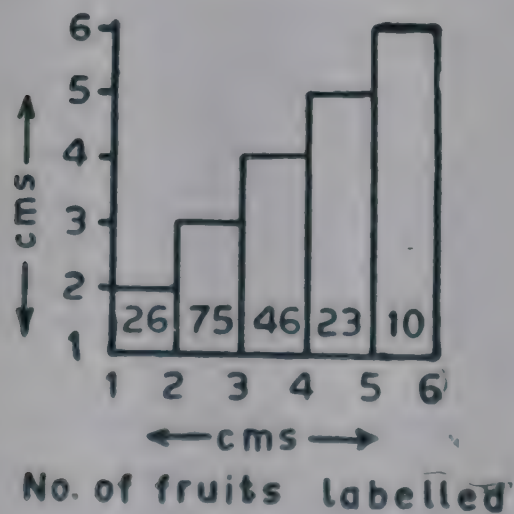


FIG. 1a

at the same time irrespective of their initial sizes. By the 1st week of May, fruits more or less of same size could be seen at tree tops. The fruit drop was found to be more at initial stages when the length of the fruit was between 1 and 3 cm (Fig. 2). The drop nearly ceases by middle of April and almost

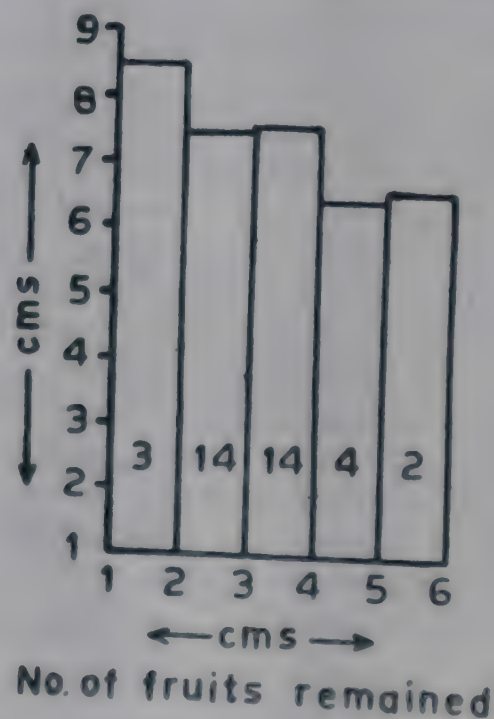


FIG. 1b

stops by the last week of April. The percentage cumulative fruit drop was about 45 to 80 per cent between two trees.

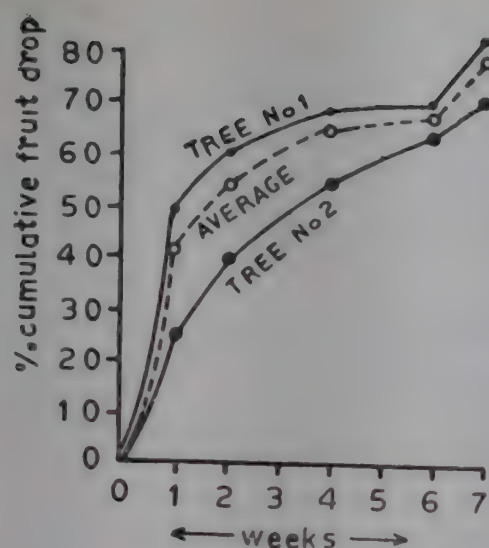


FIG. 2

With regard to *Totapuri* variety of mango growth studies revealed that nearly 9 weeks would be taken for its maximum growth commencing from initial size of 1 cm, unlike *Neelum* even in the month of May different sizes of fruits of *Totapuri* variety could be seen in a single tree. The growth studies were done for about six weeks. Figure 3 shows the maximum growth attained by different sizes of fruits. This can also be seen from the figures 4a and 4b. Figure 3 shows that the maximum period of 9 weeks will be taken by this variety to reach its maximum size and maturity for pickling purpose. At this period the average length of the fruit was about 14 cm.

Figure 5 shows the variation in per cent cumulative fruit drop among six trees of *Totapuri* mangoes. The yield of 40 to 50 per cent was observed in two trees where their initial lengths at the time of labelling were between 3 to 5 cm. From middle of April to 1st week of May fruit drop almost ceased. Later on, the fruit drop was caused due to strong winds and commencement of monsoon.

Among table varieties, mangoes of *Sakkargutti* variety was the smallest in size. It had more or less round shape of

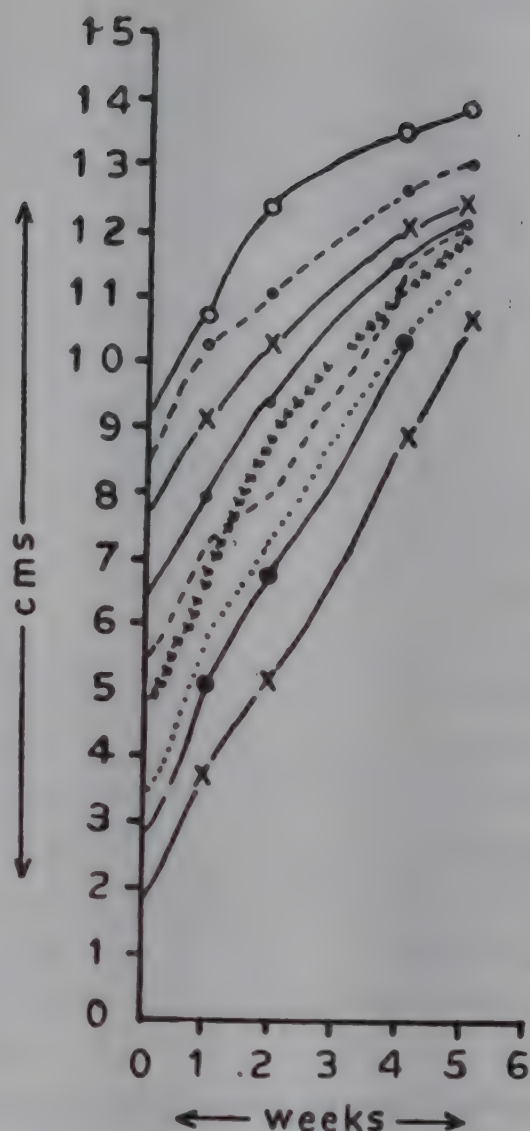


FIG. 3

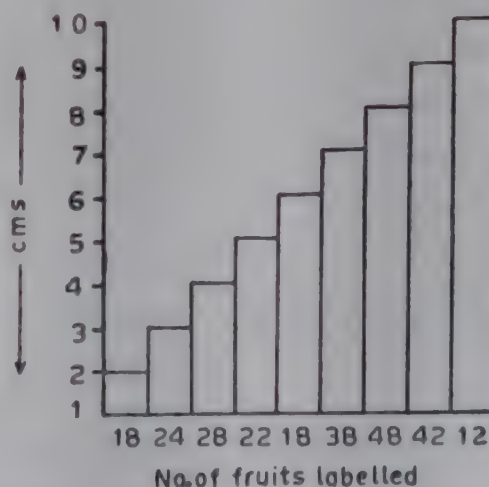


FIG. 4a

5.4, 4.9 and 4.4 cm (l:b:f) and weighed about 70 g at the pickling stage. *Neelum* and *Maddur special* were rather medium sized fruits weighing about 120 g whereas *Suvarnarekha*, *Totapuri* and *Rasam* had oval shape and weighed nearly 220 g.

Table 3 gives the analysis of different varieties of mangoes at optimum stage of maturity. Among pickle varieties the sweet variety of Sakkalli had a thick and rough peel with almost round shape weighing about 120 g. *Amlet* was the biggest

TABLE 2

Variety	Change in moisture percentage			Further decrease in moisture after the maturity stage in kernel
	Peel	Flesh	Kernel	
<i>Neelum</i>	77-71.2	85.5-77.7	80-67.0	46.1
<i>Sakkargutti</i>	72 to 68	84-78.5	80 to 53	35.0
<i>Rasam</i>	64.5	80.2	50.0	47.0
<i>Suvarnarekha</i>	70.0	79.2	63.4	67.2
<i>Maddur sp.</i>	74.0	77.5	38.6	31.1
<i>Totapuri</i>	80-76.5	88-84	85-77	...
<i>Banganapalli</i>	76-72	88-84	84-68.9	...
Sakkalli (pickling)	75-72	88-86	80-43	39.0
Bogadi (pickling)	80-75	90-86	83-40	...

TABLE 3. Physico-chemical constituents of different varieties of

Sl. No.	Variety	Measurements (cm)			Percentage ratio of				Average wt. of one fruit (g)
		Length	Breadth	Flat	Peel	Flesh	Kernel	Shell	
1.	<i>Neelum</i>	7.34	5.66	5.2	9.8	67.6	11.3	11.3	129
2.	<i>Rasam</i>	10.16	5.58	6.11	13.6	70.6	7.6	9.2	228
3.	<i>Sakkargutti</i>	5.44	4.90	4.41	14.0	63.0	14.0	9.2	67
4.	<i>Suvarnarekha</i>	9.84	7.1	6.23	10.4	76.7	7.2	5.7	241
5.	<i>Maddur sp.</i>	6.19	5.99	5.60	11.0	70.0	9.5	9.5	121
6.	<i>Totapuri</i>	10.99	6.43	5.5	9.1	80.0	6.0	4.9	187
7.	Sakkalli (pickle variety)	7.39	6.09	5.7	15.0	60.6	13.4	11.0	148
	Small								
	Big	12.1	9.01	8.32	8.1	78.8	5.5	7.6	497
8.	Bogadi (pickle-seedling)	8.28	7.12	6.12	9.0	71.4	9.0	10.6	192
9.	<i>Banganapalli</i>	10.45	8.62	6.9	7.8	77.8	5.2	9.2	317

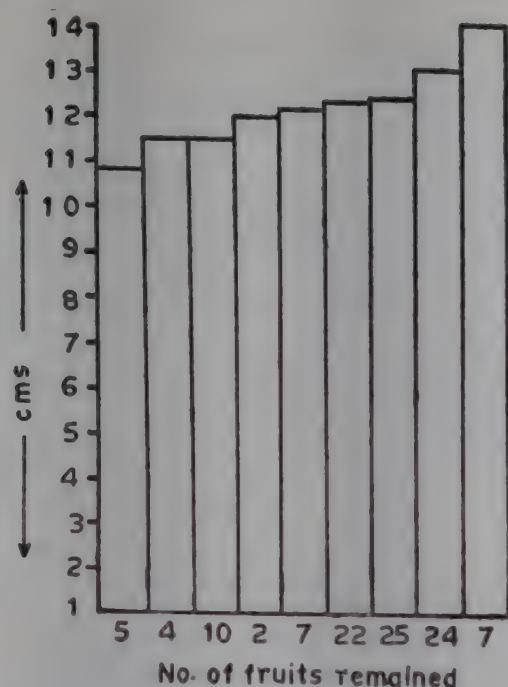


FIG. 4b

measuring 13 to 14 cm in length and weighing 600-700 g. Bogadi seedling and *Banganapalli* measured 10 cm in length and weighed about 250 g. The small size pickle variety from Sakkalli garden measured 6 cm and weighed about 130-150 g. All these

mangoes at the optimum stage of maturity

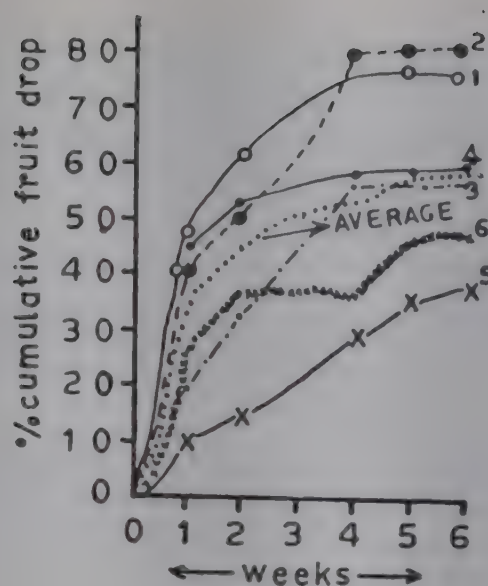


FIG. 5

measurements given were at the optimum stage of maturity (Table 3).

It is difficult to differentiate between the table and the pickle varieties by their measurements, weights or by their peel-flesh-kernel ratios of a fruit. However, in general, small sized mangoes measured 6-8 cm in length, weighed about 120 g and had a flesh content of about 70 per cent, whereas big sized

Per cent moisture			Acidity as anhydrous citric acid			Sugars		Vit. C mg/100 g			pH	Brix
Peel	Flesh	Kernel	Peel	Flesh	Kernel	TRS	RS	Peel	Flesh	Kernel		
71.2	77.7	42.5	0.70	2.21	1.34	2.2	1.8	264	149	nil	3.2	10.3
70.2	82.3	58.4	0.48	1.57	1.28	5.8	2.45	546	168	nil	3.4	9.3
70.0	80.0	53.0	0.70	3.32	1.15	3.6	1.5	50	60	10	3.2	7.3
70.8	79.2	63.4	1.06	1.25	1.41	6.6	3.4	13	nil	nil	3.3	9.3
64.5	79.5	38.6	1.51	4.00	1.15	3.2	2.5	110	60	nil	3.0	10.3
77.0	84.3	77.2	0.64	1.57	1.29	3.4	2.15	66	nil	nil	3.2	8.3
79.1	89.5	43.5	1.34	4.96	1.38	1.4	1.1	237	70	nil	2.9	7.3
72.0	86.0	39.1	0.67	3.44	1.15	3.6	1.85	349	100	nil	2.9	8.3
78.0	85.9	40.0	1.44	4.48	1.06	3.0	0.7	406	126	nil	3.0	6.3
72.5	84.7	67.9	0.45	0.96	1.92	5.0	2.75	70	20	nil	3.7	9.3

mangoes measured more than 10-13 cm in length, weighed about 400-600 g depending on their size and had a flesh content of about 78-80 per cent.

Moisture

Generally, during the growth period a decline in the moisture content was observed in the peel and kernel.

Except in *Totapuri* and to some extent in *Banganapalli* and *Surcarnarekha* in all the other varieties a decrease between the initial and final moisture content was in the range of 4 to 6 per cent, 4 to 10 per cent and 30 to 40 per cent at the optimum stage of maturity in the peel, flesh and kernel respectively. In *Totapuri*, the kernel was observed to have 77 per cent moisture content unlike all the other table varieties. The change in moisture content during growth has been given in Table 2.

Moisture content beyond the optimum stage of maturity showed a further decline of 10 per cent indicating that the fruits were more useful for table purpose rather than for pickling purpose (Table 2).

The texture of the fruits of these varieties was good and firm, fit for pickling at the optimum stage of maturity. The seedling varieties showed a high moisture content of 86 to 90 per cent. These varieties tended to softness, became juicy when left to grow further. However, these could be used for pickling by being picked two or three weeks earlier, say last week of April or first week of May.

Acidity

Much change was not observed in the sourness of the flesh part of the fruit as ascertained by the measurement of acidity during the growth period, until the fruits reach the optimum stage of maturity. After that in a few varieties percentage decline

of acidity was noticed by the middle of May, this is perhaps an indication of the over-maturity of the fruit rendering them unfit for pickling but suitable only for table use. The decrease in acidity was from 1 to 0.5 per cent in *Banganapalli*, 3 to 1.8 per cent in *Sakkalligutti*, 1.6 to 1.3 per cent in *Rasam*, 4 to 2 per cent in *Maddur special*, 5 to 3.4 per cent in *Sakkalli* pickle variety and 2.2 to 1.2 per cent in *Neeham*.

Other varieties like *Bogadi* pickling, *Totapuri* and *Surcarnarekha* showed almost constant percentage of acidity even after the optimum maturity period as 4.5, 1.6 and 1.3 per cent respectively.

In all the varieties, *Bogadi* pickling and *Sakkalli* pickling varieties had high acidity of 4.5 per cent to 5 per cent and *Sakkalli* sweet variety had low acidity of 0.3 per cent.

pH of the fruits

All through their growth and at the optimum stage of maturity all the table varieties had a pH between 3.2 to 3.4. *Bogadi* pickling and *Sakkalli* pickling varieties had pH ranging between 2.4 to 2.8 during their growth.

Total soluble solids

All the varieties had refractometric solids between 8 to 9° Brix.

Sugars

All varieties except the *Sakkalli* sweet variety had total reducing sugars between 3 per cent to 5 per cent. *Sakkalli* sweet variety had a comparatively high sugar content of about 7 per cent at the optimum stage of maturity.

Ascorbic acid

Generally peel of the fruits contained more ascorbic acid than that in the flesh. Kernel had negligible quantity of this acid. During the growth of the fruits, there was considerable decline in the ascorbic acid content. Of all the varieties studied *Neeham*

riety and the Sakkalli pickling variety at their optimum stage of maturity showed significant content of ascorbic acid. *Banganpalli*, *Suvarnarekha* and *Maddur special* varieties had negligible quantity of vitamin C. All other varieties contained 20 to 50 mg of ascorbic acid per 100 g at the maturity level.

Amlet variety of mangoes from KRS has already been discussed in the earlier paper.³

Summary

1. Irrespective of early or later flowering and commencement of fruit labelling, *Neelum* variety reaches its optimum stage of maturity and full development at the same time for pickling.
2. *Totapuri* variety takes the maximum period of nine weeks for its full growth from the labelling period to optimum maturity.

3. Period of optimum maturity for *Totapuri* and *Neelum* varieties generally takes place between the last week of April and the first week of May.

4. The final moisture content of the kernel of the table varieties in general is less than that of the pickle varieties, the former having an average of 40 per cent and the latter 60 per cent.

5. Physico-chemical characteristics of *Totapuri* variety differ considerably from those of the other table varieties.

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PARTIAL SUBSTITUTION OF WHEAT FLOUR BY OTHER FLOURS FOR BREAD PREPARATION—PART I.

USE OF CEREAL FLOURS

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Traditionally bread is made from wheat because of its unique flour characteristics. The main consumers of wheat are the developing countries of East Asia, Middle East, South Africa, and South America. However, supply of good quality wheat falls short of demand and has to be made good through imports from other countries². Due to increasing consumption of bread and bakery products as well as other food preparations, production of wheat varieties suitable for bakery products is not keeping pace with the demand. From the standpoint of National economy, extending wheat supply by partial substitution by other cereals such as maize, milo etc. could offer a solution. Further, growth of bread-making industry in our country is limited due to shortage of suitable raw materials in adequate quantity.³ A few attempts have been made so far to overcome this problem.^{1,4} The present paper attempts to show that sorghum, milo and maize can be used to some extent as wheat substitutes. The objective of the trials was broadly to assess the proportion in which wheat flour could be substituted by other flours without sacrificing the characteristics of the raw materials in the production of a good piece of bread loaf.

Materials and Methods

Commercially supplied refined wheat flour (100 mesh) by Food Corporation of India, Kanpur and flours prepared from

yellow maize (*Zea Mays*), sorghum (*Sorghum vulgare*) and Indian milo (*Pennisetum typhoideums*) (35 mesh). Small samples of cereals used by blending were obtained by using an ordinary stone mill and the finest particle size obtainable was 35 mesh.

These samples were employed at the levels of 5 per cent, 10 per cent and 15 per cent. Experimental doughs were prepared with following formulations (in parts): wheat flour, 100; sugar (sucrose) 3; yeast (compressed) 2; salt, 2; glyceryl mono stearate (G.M.S.), 0.4; oil (vegetable oil), 1.25; calcium propionate, 0.2; vitamin premix, 0.02; water, variable; blending flours, 5 per cent, 10 per cent and 15 per cent of wheat flour.

The flow sheet of the process followed was as follows: Weighing of Ingredients → Mixing → Fermentation → Dividing → Rounding — → Intermediate proofing → Moulding — → Panning → Proofing → Baking → Cooling → Slicing → Wrapping.

All the ingredients were mixed thoroughly in a laboratory size mixer, taking 2 kg wheat flour as base. Total mixing time was 8-9 min., with 5 minutes on slow speed (52 r.p.m.) and 3-4 min. at high speed (120 r.p.m.). The dough was allowed to ferment at 80-85°F and 80 per cent R.H. for 45 min. Dough pieces were divided by hand and weighed (450 g each). Intermediate proofing was done for 5 min. at room temperature after rounding. Proofing time for different

blends was arrived at, on the basis of a standard volume developed by dough, before entering the oven for baking. Thus proofing time was found to be (1) 3 hr at 75°F for milo, (2) 2.15 hr at 84°F for sorghum and (3) 3 hr at 74°F for maize. Baking was done at 420°F for 30 min. Then loaves were cooled for a minimum of 3 hr (Temp. 23°C) before slicing and wrapping.

Farinographic studies of flour blends were done by using Brabender's Farinograph and the method described by Matz.⁶ The data obtained are given in Table 1.

TABLE 1. Results of farinographic studies

Name and percentage of blended flour	Water absorption power (W.A.P.) (%)	M.T.I. (B.U.) Mechanical tolerance index (Brabender unit)	Dough development time (min.)	Stability (min.)
Pure wheat flour	59.8	7	2	4.40
Sorghum 5%	62.6	80	1.25	3.25
Sorghum 10%	61.0	50	1	5.5
Maize 5%	60.0	75	2	3.75
Maize 10%	62.8	90	1.5	4.25
Indian milo 5%	61.6	70	2	3.9
Indian milo 10%	62.0	120	1.5	3.25

The bread samples were analysed⁶ for moisture (oven drying method, at 105°±5°C for 4 hr). Average weights and average volumes of loaves were also determined. Scoring of bread samples was done using a score card prescribed by Modern Bakeries. Each trial yielded seven loaves of 400 g. All the samples were run in duplicate. Organoleptic quality was assessed by two taste panels of six members each at Modern Bakeries, Kanpur and H.B.T.I., Kanpur. Results are given in tables 2, 3 and 4.

TABLE 2. Results for the 'sorghum' blended bread

% Addition	0%	5%	10%	15%
Avg. weight (g)	398	378	370	389
Avg. volume (cc)	1770	1740	1640	1410
Density (g/cc)	0.21	0.21	0.22	0.26
Water absorption (%)	63.7	63.6	63.7	65.2
Moisture content (%)	42.98	43.3	43.20	44.2
Preference (scoring)				
Modern Bakery Staff	10	8.9	7.75	6.38
H.B.T.I. Staff	10	8.34	6.78	6.3

TABLE 3. Results for 'maize' blended bread

% Addition	0%	5%	10%	15%
Avg. weight (g)	390	401	394	415
Avg. volume (cc)	1730	1685	1625	1595
Density (g/cc)	0.22	0.24	0.24	0.26
Water absorption (%)	62	60.9	60.0	60.9
Moisture content (%)	43.4	43.9	43.6	43.6
Preference (scoring)				
Modern Bakery Staff	10	9.5	8.45	7.3
H.B.T.I. Staff	10	9.3	8	7

Results and Discussion

The experimental work can be divided in two parts, viz., (1) Results dealing with the behaviour of the flour blends during preparation of the dough and before it is ready for baking, and (2) The quality of bread obtained.

Water absorption power (W.A.P.) is one of the important criteria considered while

TABLE 4. Results for 'Indian milo'
blended bread

% Addition	0%	5%	10%	15%
Avg. weight (g)	409	391	400	409
Avg. volume (cc)	1570	1530	1416	1390
Density (g/cc)	0.26	0.25	0.28	0.29
Water absorption (%)	60	63	64	65.2
Moisture content (%)	39.3	40.2	38.6	39.8
Preference (scoring)				
Modern Bakery Staff	10	8.29	6.7	5.2
H.B.T.I. Staff	10	8.0	6.9	5.8

assessing the quality of the flour. From the figures presented in Table 1, it will be seen that in the case of maize and milo blends the increase in W.A.P. corresponds with increase in the percentage of substitute flour. However, in case of sorghum as a substitute the above relationship shows a reverse trend. Time required for the development of dough had an inverse relationship with increase in percentage of substitute flour. The stability of the dough also showed a similar trend. However, in this case the sorghum and maize substitutes were more helpful than milo.

Sedimentation values of flours were found to be as follows: (i) 26 ml for wheat flour, (ii) 20 ml for 10 per cent milo, (iii) 20 ml for 10 per cent maize and (iv) 20 ml for 10 per cent sorghum. Volume of the loaves was found to decrease with increase in the percentage substitution. When compared within themselves, maize substitute gave greater volume and the milo substitute resulted in minimum volume, specially at 15 per cent substitution level.

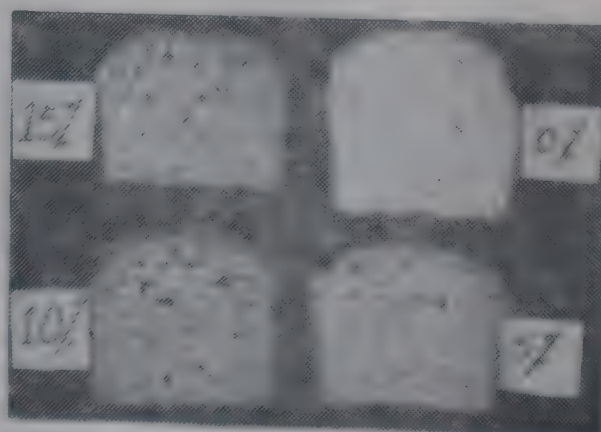
The compactness in the bread loaves is generally expressed in terms of density of loaf. This increase corresponds with an

increase in the level of substitute flour. Per cent moisture content in bread was estimated using central portion of the loaf. It was found that bread containing sorghum and maize substitution had 43-44 per cent moisture and sample containing milo had 39 per cent moisture at levels of substitution. Ash content of the loaves containing substitute flour at 10 per cent level was around 2.5 per cent, which is slightly higher than the ash content of standard loaf. At 15 per cent substitution bread loaves were quite brittle. In case of milo and sorghum blends, the brittleness was more marked.

The overall acceptability in case of maize blend was upto 10 per cent level compared to sorghum and milo blends which were not acceptable beyond 5 per cent substitution. Colour, flavour and taste were excellent in loaves containing 10 per cent substitution by maize and sorghum flours. When milo was mixed upto 10 per cent level, the loaves had a higher sweetness index. However, the colour of the loaf was not very acceptable.

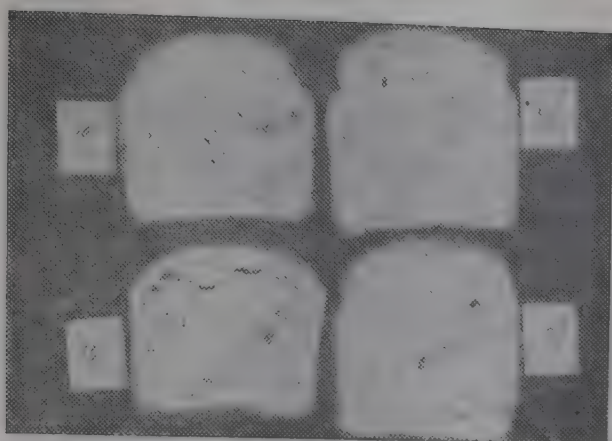
The shelf-life of all the bread loaves was found to be 5-6 days at 27°C (Room Temp.) during the months of Feb./March 1974, which compares well with that of the conventional wheat loaves.

Differences in dough rising, crumb colour and structure are apparent in the photographs of these samples.

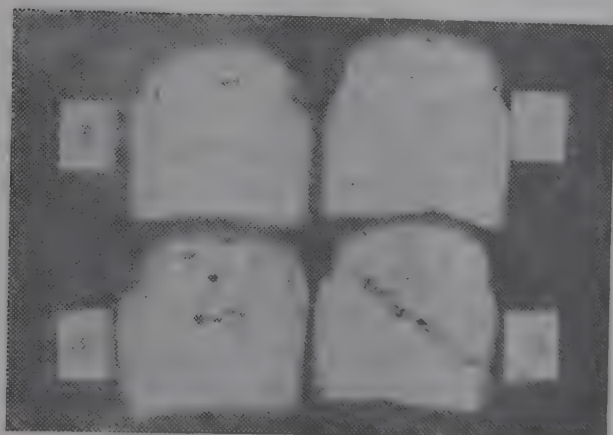


Bajra (Milo)

INDIAN FOOD PACKER



Sorghum (Jowar)



Maize (Makka)

Conclusions

The results indicate that the characteristics of blended flour in terms of finished product are very close to the characteristics of a full wheat flour bread loaf, when the substitution was upto 10 per cent for maize and 5 per cent for sorghum and milo flours.

When wheat flour is partially replaced by other flours, the volume of the loaf showed a decrease; however, the colour, crust and the nature of the crumb upto 10 per cent substitution were not much different from those characteristics present in the wheat flour bread loaves. In fact, on toasting, the blended flours loaves gave a more satisfactory toast

compared to full wheat loaf toast. The results in the present experiments indicate that partial substitution of wheat by other cereal flours could be satisfactorily done. Apart from affecting some economy in the cost of raw material with substitution of wheat flour with other cereal flour, the results point out a possibility of a regular saving of wheat flour thereby diverting saving in wheat to other methods of utilization requiring use of wheat flour alone.

Further work is planned to explore the possibility of using higher percentages as well as pre-treatments of cereals prior to their blending with wheat flour.

Acknowledgement

Authors are grateful to Modern Bakeries, Kanpur and Grain Storage Research and Training Centre, Hapur (U.P.), for providing facilities for the preparation of bread samples and farinographic studies of flours respectively.

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PARTIAL SUBSTITUTION OF WHEAT FLOUR BY OTHER FLOURS FOR BREAD PREPARATION—PART II.

USE OF PULSE FLOUR

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Traditionally bread is made from wheat because of its unique flour characteristics but wheat is known to be deficient in lysine. Fortification with lysine has been in practice in foreign countries and recently taken up by Modern Bakeries in India. *Per capita* consumption of protein in India is lower than that prescribed by W.H.O.⁴ Apart from increasing consumption of protein foods, fortification of foods with protein, vitamins and minerals is being recommended. Fortification of bread with soy flour has been done at levels up to 20 per cent of the mix^{1,3}. However, further research work based on local conditions to increase the quantity and quality of protein in such breads has been proposed.² The consumption of pulses in India as a regular article of diet is quite common. Use of bread as convenience food has more or less established itself among different strata of urban people and has shown an impact in smaller townships. Enrichment of bread with protein through partial substitution of wheat flour with pulse flour was considered as having good prospects of application by the baking industry. This report is intended to present trials conducted to study the suitability of pulses such as gram, lentil and peas containing 17.1 per cent, 25.1 per cent and 19.77 per cent protein respectively for partial substitution.

Materials and Method

Commercially supplied refined wheat flour (100 mesh) by Food Corporation of India,

Kanpur and flours prepared from gram (*Cicer arietinum*), lentil (*Lens esculenta*) and peas (*Pisum sativum*) (35 mesh) at the level of 5 per cent, 10 per cent and 15 per cent were used in preparation of experimental samples of bread. The formulation used was in parts: wheat flour, 100; sugar (sucrose), 3; yeast (compressed), 2; salt, 2; glyceryl mono stearate (G.M.S.), 0.4; oil (vegetable oil), 1.25; calcium propionate, 0.2; vitamin premix, 0.09; water, variable; blending flours 5 per cent, 10 per cent and 15 per cent of wheat flour.

The method of preparation of dough, proofing, baking and packing was the same as reported elsewhere.⁸

There was some difference in the time allowed for proofing because of a basic difference in the flour blends. This is detailed below:

Blend	Temperature	Duration
Containing gram and lentil	72°F	3.25 hr
Containing peas flour	80°F	2.30 hr

Farinographic studies of flour blends were done by using Brabender's Farinograph and the method described by Matz.⁶ The data obtained are given in Table 1.

All the samples were run in duplicate taking 2 kg of wheat flour as a base. Samples were analysed⁵ for moisture, volume increase and per cent of protein. Taste-testing was carried out by panels selected from Modern

TABLE 1. *Farinographic characteristics*

Name and percentage of blended flour	Water absorption power (W.A.P.) (%)	Mechanical tolerance index M.T.I.-Brabander unit (B.U.)	Dough development time (min.)	Stability (min.)
Pure wheat flour	59.8	70	2.0	4.40
Gram flour 5%	61.8	80	2.5	3.7
„ 10%	63.0	60	1.5	2.5
Peas flour 5%	62.4	70	2.5	3.5
„ 10%	63.8	110	1.0	3.0
Lentil flour 5%	62.2	40	2.0	3.25
„ 10%	64.0	80	0.75	3.5

TABLE 2. *Results for 'gram' blended bread*

% Addition	0%	5%	10%	15%
Avg. weight (g)	393	396	411	407
Avg. volume (cc)	1710	1742	1715	1630
Density (g/cc)	0.23	0.23	0.24	0.25
Water absorption (%)	60	58.9	56	56.6
Moisture content (%)	43.27	43.6	42.96	43.0
Protein content ($\frac{w}{n}$)	9.09	...	13.3	...
Preference (scoring)				
Modern Bakery Staff	10	8.88	8.43	7.93
H.B.T.I. Staff	10	9.99	9.13	8.1

Bakeries, Kanpur and H.B.T.I. staff. The results are presented in tables 2, 3 and 4.

Results and Discussion

The experimental work was divided in two parts, viz., one part dealing with the behaviour of the flour blends during preparation of the dough prior to baking and

the other dealing with the quality of the bread.

It would be seen (Table 1) that in case of gram, lentil and peas flour blends, the increase in W.A.P. (Water Absorption Power) corresponds with increase in the percentage of pulse flour. The time required for the development of dough had an inverse relationship with increase in percentage of substitute flour. The stability of the dough also showed a similar trend. Sedimentation values of flours were found to be as follows: (i) 26 ml for wheat flour, (ii) 19 ml for 10 per cent gram, (iii) 19 ml for 10 per cent lentil and (iv) 19 ml for 10 per cent peas flour.

Volume of the loaves was found to decrease with increase in the percentage substitution. When compared within themselves, gram substitute gave greater volume and the peas substitute resulted in minimum value, specially at 15 per cent substitution level. The compactness of bread loaves is generally expressed in terms of density of loaf. Generally speaking the compactness increased along with an increase in the level of substitute flour. As regards per cent moisture in central portion of the loaf, it was observed that bread containing gram, lentil and peas substitution had 42-43 per cent moisture which was close to moisture in the control sample. As regards the overall acceptability gram blends were acceptable upto 15 per cent compared to lentil and peas blends which were not acceptable beyond 10 per cent and 5 per cent substitution respectively. Colour, flavour and taste were excellent in loaves containing 15 per cent substitution by gram, 10 per cent substitution by lentil and 5 per cent substitution by peas flour. The loaves containing more than 5 per cent peas flour had bitter taste.

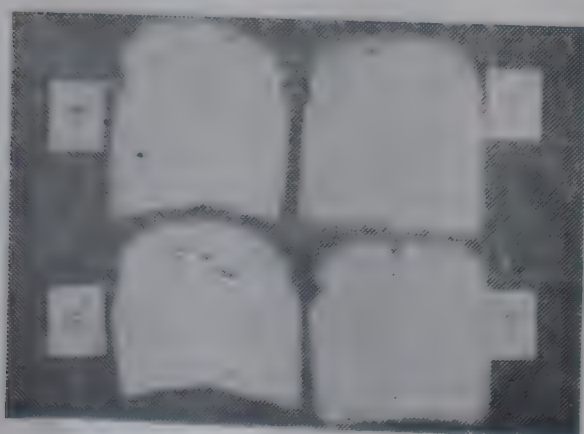
The shelf-life of all the bread loaves was found to be 5-6 days at room temperature (27°C) during the months of Feb./March 1974, which compares well with conventional

TABLE 3. Results for 'lentil' blended bread

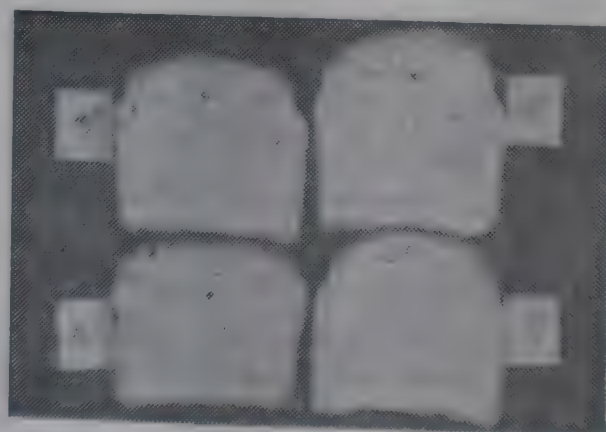
% Addition	0%	5%	10%	15%
Avg. weight (g) ...	406	405	404	412
Avg. volume (cc) ...	1780	1787.5	1672.5	1590
Density (g/cc) ...	0.23	0.23	0.24	0.26
Water absorption (%) ...	60	58.6	59	61.3
Moisture content (%) ...	42.84	42.42	42.75	43.16
Protein content (%) ...	9.09	9.86	11.63	...
<i>Preference (scoring)</i>				
Modern Bakery Staff ...	10	9.2	8	6.6
H.B.T.I. Staff ...	10	8.3	8	7.46

TABLE 4. Results for 'peas' blended bread

% Addition	0%	5%	10%	15%
Avg. weight (g) ...	382	395	395	409
Avg. volume (cc) ...	1880	1635	1470	1455
Density (g/cc) ...	0.2	0.24	0.27	0.28
Water absorption (%) ...	59	57	57.3	56.60
Moisture content (%) ...	43.4	42.8	43.2	42.91
Protein content (%) ...	9.09	...	11.34	...
<i>Preference (scoring)</i>				
Modern Bakery Staff ...	10	8.6	6.95	6.14
H.B.T.I. Staff ...	10	9.2	8.14	7.6

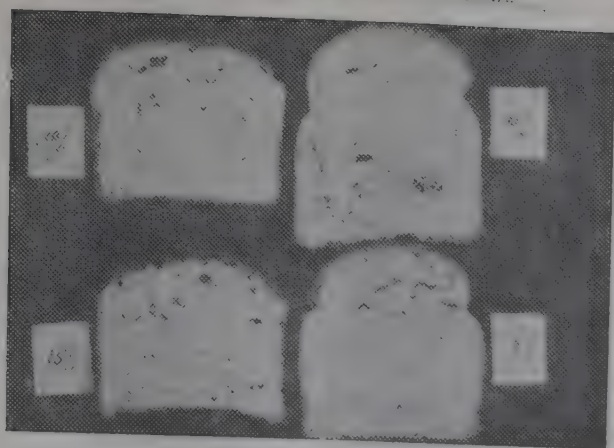


Gram (Chana)



Lentil (Masur)

INDIAN FOOD PACKER



Peas (Mattar)

wheat loaves. Comparison of dough rising, crumb colour and structure can be done from photographs.

Conclusion

The results indicate that loaves containing 15 per cent gram flour, 10 per cent lentil flour and 5 per cent peas flour were acceptable and judged as quite good. Crust colour and nature of the crumb of loaves containing 15 per cent gram flour and 10 per cent lentil flour as well as peas flour were not different from full wheat flour loaves. In fact toasting character of loaves containing pulse flours was better, compared to full wheat loaf toast. The results, therefore, show that partial replacement of wheat flour by pulse flours could be satisfactorily done. Apart from increase in protein content such partial substitution would be helpful in increasing the lysine content of bread because

the legumes are richer in lysine content compared to wheat.

Further work is planned to explore the possibility of using higher percentages as well as pretreatments of pulses in order to remove or minimize the flavour effect of pulse flours in the finished products.

Acknowledgement

Authors are grateful to Modern Bakeries, Kanpur and Grain Storage Research and Training Centre, Hapur (U.P.), for providing facilities for the preparation of bread samples and farinographic studies of flours respectively.

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Book Review

Food Analysis Laboratory Experiments, by CLIFTON E. MELOAN AND YESHAJAHU POMERANZ, Published by The Avi Publishing Company, Inc., Westport, Connecticut, 1973, pp. 143.

This manual provides experiments to elucidate the principles discussed in the authors' text book 'Food Analysis, Theory and Practice'. The subject coverage in the manual has been divided into three parts—(i) instrumental techniques in food analysis, (ii) standard methods of food analysis, and (iii) certain selected methods of analysis not covered above.

Under the instrumental methods are covered visible spectroscopy, turbidimetry, fluorimetry, infra red spectroscopy, flame photometry, atomic absorption spectroscopy, potentiometry, conductivity, polarography, disc electrophoresis, column, ion-exchange, gel elution, thin layer and gas chromatography, continuous extraction, the Craig apparatus, dialysis, flotation, molecular distillation, polarimetry and refractometry. These are covered in the first twenty-three chapters. Under each instrumental method, general information, equipment, chemical and material needed, procedure, sample calculation, review questions and relevant literature references are given. In some chapters, the principle of method is discussed, while in others, it is omitted. It would have been more useful if the principle of the method had been given for all the instrumental methods. The methods selected are well tried out ones based on many years of collaborative study and are thus

authoritative. Spectrophotometry is used most widely in food analysis. Due emphasis has been given to the Ringbom plot which gives the range of transmissions in which a particular estimation is most accurate. In many chapters, food samples are chosen for analysis while in others, samples other than foods are chosen. It would have been more appropriate to have chosen samples in the domain of foods.

Chapters 24 to 29 cover methods for determining the proximate composition of foods. The methods given are standard ones recommended by such organisations as Association of Official Analytical Chemists, American Association of Cereal Chemists, American Society of Brewing Chemists and American Oil Chemists Society, and need no comment. The format followed is exactly the same as in earlier chapters.

In chapters 30 to 33 are included miscellaneous methods such as enzymatic methods, vitamin assay, chemical oxygen demand and mycotoxins—determination of aflatoxins by various methods. Methods included are either well tried out ones or those recommended by well-known organisations and include the scope and applicability.

The manual includes useful table and figures and appendices giving tables of logarithms, atomic weights, the international system of units, etc. The general review questions given at the end of the book symbolizes the philosophy and the need for food analysis in their various manifestations.

The manual covers a wealth of information and is a must for students taking courses in food analysis and food technology.

S. RANGANNA

NOTES and NEWS

- *A Study on the Chemical Composition of Green Leafy Vegetables available in Northern India*
- *Effect of Different Methods of Storage on the Ascorbic Acid Content of Vegetables*
- *Honey as an Income Source*
- *Fish Processing*
- *Cashew Exports*
- *Rajasthan: Export Potential Survey*
- *Himachal Pradesh: Fruit Processing and Automatic Bakery*
- *Madras: Packaging of Food Products*
- *Mysore: Symposium on Fish Processing Industry in India*
- *Cochin: Packaging of Marine Products*
- *Canned Fruit and Vegetable Products*
- *Development Scheme for Konkan*
- *West Bengal: IDA Credit*

A Study on the Chemical Composition of Green Leafy Vegetables available in Northern India

In India, green leafy vegetables have received a considerable attention by the nutritionists as a simple and economical means of providing vitamins and minerals to the people. The important leafy vegetables are mustard greens (*Brassica campestris* var. Sarson), spinach (*Spinacia oleracea*), amaranth (*Amarantus gangeticus*), fenugreek leaves (*Trigonella foenumgraecum*), mint (*Mentha spicata*) and coriander leaves (*Coriandrum sativum*). Some work on these has been reported by Aykroyd *et al.*² and Goje⁴. It was considered desirable to find

out nutritional constituents such as β -carotene, minerals, crude fibre etc. of these vegetables. With this objective in view, a study was conducted, the results of which are reported here.

Fresh mustard greens, spinach, mint and coriander leaves were procured from the local market as well as from the vegetable farm, PAU. The fresh leaves were sorted, cleaned, trimmed and washed four times in cold water. Representative samples weighing 5 g each were taken in a mortar and macerated with a pestle. Moisture, ash, crude fibre and chlorophyll content were determined by A.O.A.C.¹ methods and β -carotene by Davis³ method.

The results are given in the table below:

Some chemical constituents of fresh green leafy vegetables (1970-71 and 1971-72)

Name of vegetable	Mustard greens	Spinach	Mint	Coriander leaves
Constituents				
Moisture (%)	89.0	91.0	84.9	86.3
Ash (%)	1.7	1.9	1.9	2.0
Crude fibre (%)	1.0	0.9	1.0	1.2
Chlorophyll (mg/g)	1.25	1.30	1.78	2.27
β -carotene (mg/100 g)	2.6	2.5	1.6	3.2

As is clear from the table, the bulk of green leafy vegetables was comprised of water within the range of 84.9 to 91.0 per cent. The ash content of coriander leaves was higher which was followed by mint, spinach and mustard greens. It was in the range of 2.0, 1.9 and 1.7 per cent respectively. So far, no separate work was reported on

the contents of mustard greens, spinach, mint and coriander leaves. On an average, crude fibre was rated higher in coriander leaves followed by mustard, mint and then spinach. According to Aykroyd *et al.*,² mint should have the higher value of crude fibre followed by coriander leaves, mustard greens and spinach.

Work has also not been reported on the chlorophyll and β -carotene content of mustard greens, mint and coriander leaves. In the present study, it was found that the coriander leaves, normally valued for their flavour, had the highest level of chlorophyll, i.e. 2.27 mg/g. The chlorophyll content of mustard greens was comparable to those of spinach. The highest value of chlorophyll in coriander leaves was followed by mint, spinach and mustard greens; the values were 1.78, 1.30 and 1.25 mg/g respectively.

The present study also revealed that the value of β -carotene content in coriander leaves was 3.2 mg/100 g followed by mustard greens, spinach and mint, i.e. 2.6, 2.5 and 1.6 mg/100 g respectively. The coriander leaves are, therefore, rich in pro-vitamin A than other leafy vegetables. The β -carotene content of spinach was also rated high than the value reported. Better selection of the raw material seems to be responsible for this variation.

The authors wish to place their gratitude to the Indian Council of Agricultural Research, Krishi Bhavan, New Delhi, for the award of fellowship which enabled us to undertake this study.

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Effect of Different Methods of Storage on the Ascorbic Acid content of Vegetables

Vegetables contain a good amount of ascorbic acid. Vitamin C from the vegetables get destroyed during storage. The loss of ascorbic acid depends upon the method adopted for storage.

The present investigation was undertaken to study the effect of different methods of storage on the loss of ascorbic acid content of vegetables.

Materials and Methods

Eight varieties of vegetables were brought fresh from the local market. The vegetables were divided into four groups. The samples were kept in duplicate. One group was immediately used for analysis and this provided the ascorbic acid content of vegetables brought fresh. Of the other groups, one group was kept at room temperature (the room temperature during the study period varied from 29-30.5°C), the other in the refrigerator at 10°C and the third group was covered with a wet muslin cloth and kept at room temperature. Aliquots of stored samples were analysed for ascorbic acid content after 24, 48 and 72 hours. Necessary corrections were made for the moisture loss during storage in calculating the vitamin concentration. The method of A.O.A.C. (1960) was employed for the determination of ascorbic acid.

Storage at room temperature

A loss of 5.2 to 25.6 per cent of ascorbic acid has been observed in vegetables when stored for 24 hours. Coriander leaves, spinach and radish leaves suffered the maximum while minimum losses were observed in respect of radish, chillies and tomatoes. Similar losses in respect of spinach, radish, cauliflower and potato have been reported by Pasricha (1967). When the period of storage was increased to 48 and 72 hours, there was further loss in the ascorbic acid content. Coriander leaves, spinach and radish leaves were found to lose 65.7, 46.4 and 56.7 per cent respectively when stored for 48 hours.

Storage in refrigerator

Of all the vegetables stored in the refrigerator, spinach was found to lose the most in terms of ascorbic acid while the losses in potato and radish were found to be negligible even when stored for 72 hours. The loss of ascorbic acid content in vegetables varied from 1 to 15 per cent when stored in refrigerator for 24 hours. Similar results have also been reported by Rudra (1937).

Storage by covering with wet cloth

Loss of ascorbic acid was less in vegetables when covered with wet cloth as compared to storage under ordinary room temperature. Even with green leafy vegetables the losses were less. Spinach was found to lose 17.3, 23.6 and 38.9 per cent ascorbic acid when covered with wet cloth after 24, 48 and 72 hours respectively while the per cent loss in similar period when stored under room temperature was 21.3, 32.8 and 46.4 respectively. Ascorbic acid loss in vegetables was more under this method of storage in comparison to storage in refrigerator.

Ascorbic acid content was determined in raw vegetables as well as after different

intervals of storage, i.e. 24, 48 and 72 hours. The losses were found to be maximum at room temperature and the value further decreased with the increase in storage period.

Conclusion

The method of storage influences the ascorbic acid content of vegetables. The loss of ascorbic acid is less in vegetables stored in refrigerator in comparison to other methods of storage under study. The present study revealed that losses of ascorbic acid can be minimized by storing the vegetables in a wet cloth. Losses were found to be maximum in green leafy vegetables. So, these should always be consumed as fresh as possible.

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Honey as an Income Source

G. E. Townsend, a professor at the University of Guelph, Ontario, has expressed in the United Nations Food and Agriculture Organisation's World Animal Review that many poor countries are not cashing in on a world shortage of honey.

Honey and beeswax production could be a major enterprise in dryland areas and could provide both food and income for thousands of people living in these low-income sectors.

Acacias and mesquite, which thrive under dry cultivations, are excellent honey producers.

Trained experts who could help put the honey industry on its feet in the developing

countries are found in almost all developed countries.

Fish Processing

A two-day symposium on Fish Processing Industry in India was held on February 13 and 14, 1975, under the joint auspices of the Association of Food Scientists and Technologists (India) and Central Food Technological Research Institute (CFTRI).

The symposium recognized the need for regular survey of pelagic and demersal fisheries resources and setting up of suitable conservation services to feed the industry with information on location and availability of fishes. Large scale handling and processing of pelagic fishes information should be in essential place. The symposium requested the Government of India to take urgent steps for exploration of new fish resources and launching of a crash programme to develop improved methods of handling, processing and distribution of fish water fish.

Investigations are necessary to determine quality aspects of deep sea fishes by different freezing methods. Oil content, moisture, fat, water and fibre need utmost attention with regard to freezing.

The technological problems relating to commercial production of processed shell fish like crabs, prawns and various sized prawns need by research and development programmes. Fish waste to be used for making fish vermicelli and the possibility of producing fish crackers in natural colours need be explored.

Clear-cut detailed guidelines to fish firms for the production of surface oil and fish meal. Proper and handling aspects are to be done for utilization of waste from fish processing industry. Design and development of machinery for mechanized waste utilization of fish processing are required aspects.

Crabme Exports

The 14th Annual general meeting of Crabme Export Promotion Council was held on 4th January. Shri T. M. Venkatesh Chaudhary, Chairman, said that India's crabme exports amounted to Rs 200 crores during 1973 against Rs 15.5 crores in 1972. The year this target fixed for crabme exports is First Plan was Rs 400 crores. During first nine months of the current financial year, the exports of crabme have reached over Rs 41 crores against Rs 24 crores during 1973-74.

Imports of raw materials showed a sharp fall. 1,47,000 tonnes valued at Rs 2 crores in 1972-73 to 1,54,250 tonnes at Rs 23.50 crores in 1973-74. The programme to set up indigenous production of raw crabme since major suppliers Mauritius, Tanzania and Kenya were developing their processing leaving only a small quantity for export India. The Central Government had a provision of Rs 5 crores for crabme development during the Fifth Plan up to Rs 1.50 crores during the Fourth Plan.

He commended the Kerala Government Fifth Plan scheme to cover 4,000 ha in private holdings by assisting the grower with liberal cash subsidy and supply quality seedlings. The Tamil Nadu Government had recently set up a corporation for crabme development. The Karnataka Government also had taken crabme development. Andhra Pradesh Government are expected to take similar steps.

The Crabme Corporation of India decided to promote joint sector ventures crabme extension in collaboration with governments and private trade.

Rajasthan: Export Potential Survey

The Indian Institute of Foreign Trade completed the study, Export Potential of Rajasthan, sponsored by the Rajasthani Small Industries Corporation.

The Report of the Survey, in four volumes, was presented to the State Chief Minister, Shri Harideo Joshi, by Prof. D. Kulkarni, Director-General, at a formal function held on December 17, 1974, in Raipur.

The Survey, on the basis of in-depth investigation in 525 units engaged in manufacturing 65 products in the State, has worked up action-oriented recommendations and laid out fuller and systematic exploitation of the potential offered by the State.

The report has envisaged stepping up the State's exports from the current level of about Rs 30 crores in 1973-74 to about Rs 100 crores by 1978-79. Its major suggestions relate to the creation of adequate institutional framework for export development and promotion at state level such as setting up state Board for Export Promotion and an Export Promotion wing in the Directorate of Industries; setting up an independent state Export Corporation; development of suitable facilities for transport and communications; establishment of export-oriented industries based on the State's mineral, agro-based and livestock resources, and institution of professional and technical training facilities.

Uttar Pradesh: Fruit Processing and Automatic Bakery

A Rs 77 lakh fruit processing plant at Aligarh, 10 km from Sundernagar, has been commissioned.

Set up in collaboration with the Government of the Federal Republic of Germany, which has gifted the entire machinery under the Tenth Five Year Plan package programme, the plant has an installed juicing capacity of 1.5 tonnes of fruit per hour. Juice thus obtained could be converted into 'concentrate'.

Aligarh and Kulu districts produce mainly apples, pears, lemons and mangoes. About 90 per cent of the total apple produce of the State is confined to these districts.

The plant will manufacture apple juice concentrate, apple juice, fruit jams, apple slices, lemon juice concentrate, fruit cocktail in syrup and mango juice.

A Rs 20 lakh automatic bakery has been set up at Bhiwani by the Haryana State Co-operative Supply and Manufacturing Federation. The first of its type in the co-operative sector in the country, the bakery can produce 15,000 loaves daily. Its capacity can be doubled with a small additional outlay. Initially it will cater to the needs of Rohtak, Hansi, Hissar and Jind districts.

Madras: Packaging of Food Products

The Indian Institute of Packaging organised a one-day seminar programme on 'Packaging of Food Products' at Hotel Savera, Madras, on 15th February 1975.

More than fifty delegates from various food processing and packaging material supplier industry participated.

Shri S. Sridharan, Parrys Confectionery Limited, Madras, explained the role of the Institute in promoting the knowledge of packaging in the country. He gave a brief account of the present and future activities of the Institute and invited the industries to enrol themselves as members of the Institute and take active participation in the Institute activities. He also informed the delegates that the Institute is planning to conduct its India star award 1975 function and a packaging Exhibition in Madras this year.

Shri P. V. Raju, Packaging Division, Central Food Technological Research Institute, Mysore, explained the status of food packaging in the country. He discussed the problems involved in various types of food products like oils and fats, fruits and vegetables, fish, meat and meat products, milk and milk products, bakery products, breakfast cereals, confectionery, coffee and tea, milled products, foodgrains,

beverages and spices. He explained that most of the food packaging materials and methods adopted in the country at present are based on the research and development of western countries. We have to orient our research and development work suitably to suit our needs and demands.

Packaging of Canned Foods by Shri S. R. Shetty; Packaging of Bread by Shri K. L. Radhakrishnan, General Manager, Modern Bakeries (India) Limited; Packaging of Biscuits by Shri K. S. Kannan, Standards Manager, Britannia Biscuit Company Limited; Packaging of Confectionery by Shri H. R. S. Iyengar, Factory Manager, Parrys Confectionery Limited; Packaging of Dairy Products by Shri Thomas Pathrose, Manager (Purchase), Tamil Nadu Dairy Development Corporation Limited; Packaging of Dehydrated Foods by Dr H. B. N. Murthy, Marketing Manager, Travancore Rayons Limited, were some of the papers presented for discussion.

Mysore: Symposium on Fish Processing Industry in India

The Symposium on 'Fish Processing Industry in India' was held at CFTRI, Mysore, on 13th and 14th of February 1975. It was jointly sponsored by the Association of Food Scientists and Technologists (India) and Central Food Technological Research Institute, Mysore. More than 100 delegates took part in the Symposium. Delegates from Australia, Denmark and Norway took keen interest in the Symposium. There was an interesting Exhibition of marine products, by-products and packaging materials.

Dr B. L. Amla, Director, Central Food Technological Research Institute, Mysore, presided over the inaugural function. Shri K. T. Rathod, Hon'ble Minister of State for Fisheries and Horticulture, Government of Karnataka and Chairman, Advisory Committee, delivered the inaugural address.

Shri C. P. Natarajan, Chairman, Organising Committee and Deputy Director, CFTRI, highlighted the objectives of the Symposium. Prof. P. C. George, Joint Commissioner of Fisheries, Ministry of Agriculture, New Delhi, delivered the keynote address. Dr T. N. Ramachandra Rao, President, Association of Food Scientists and Technologists (India) and Emeritus Scientist, CFTRI, extended a warm welcome to the participants. Dr V. H. Potty, Hon. Exec. Secretary of the Association and Scientist, CFTRI, proposed a vote of thanks.

Seven papers on aspects of Raw Material Resources Availability, Potentialities and Handling were presented at the session chaired by Shri G. Lakshmanayya Rao, Director of Fisheries, Karnataka, Bangalore. Shri R. Madhavan Nayar, Managing Director, Cochin Company Private Limited, took the chair at the 2nd session where three papers were presented on Freezing of Fish. Shri M. Jayaram, Deputy Director of Fisheries, Karnataka, Bangalore, took the chair at the 3rd session on Processed Fish Products. 12 papers were presented.

The 4th session on Traditional Fish Products and By-products, on 14th February, was presided over by Shri U. Sundar Kittu, Technical Consultant, Melaka Oil and Food Industries, Mangalore and Co-chaired by Dr D. P. Sen, Project Co-ordinator, Lipid Technology Discipline, CFTRI, Mysore. Ten papers on traditional fish products and by-products were presented and discussed.

The Machinery and Equipment Needs of Fish Industry was discussed at the 5th session chaired by Shri G. K. Kurian, Director, Central Institute of Fisheries Technology, Cochin. Seven interesting papers highlighting the needs of the industry were presented.

The 6th session on Quality Control and Marketing was held under the Chairmanship of Shri K. Chidambaram, Director, Marine Products Export Development

thority, Cochin and Co-chairmanship Dr K. P. Shrivastava, Deputy Director, Port Inspection Agency, Cochin. Both export and internal marketing aspects and quality control were covered by eleven presentations.

The concluding session was chaired by Prof. P. C. George, Joint Commissioner Fisheries, New Delhi and co-chaired Dr T. N. Ramachandra Rao, President of the Association of Food Scientists and Technologists (India).

Cochin: Packaging of Marine Products

A one-day seminar was organised by the Southern Regional Office of the Indian Institute of Packaging on 4th March 1975 at Malabar Hotel, Cochin. 45 delegates representing fish processing and packaging units, Government and Semi-Government organisations, trade associations and research institutes connected with marine products took part.

Shri A. I. George, Joint Director, Marine Products Export Development Authority, welcomed the delegates. He explained the role of IIP in export promotion. He advised the industries in the Southern Region to make use of the facilities given by the Institute and take active participation in the programmes.

Shri K. Chidambaram, Director, Marine Products Export Development Authority, in his keynote address gave a brief account of the developments made by the marine industries in recent years. The export of marine products has increased 20 fold in the last ten years. There are several marine products which are yet to be exploited. The main problem in exporting the marine product is packaging. The present export could be increased to a great extent by adopting improved techniques of processing and packaging.

The topics discussed in brief during the technical session are as below:

Not much attention has been given to the improvements and standardisation of presently used frozen marine product carton. They are still packed in either 2 lb. or 5 kg. unit. It is suggested that greater economy could be achieved by standardisation in the type of cartons used for frozen fish.

Canning of marine products needs improvements for export market. At present only ordinary type of lacquered P.T. cans are used for fish canning. In export market they like to have these goods packed in special type of easy opening cans. Industries are of the opinion that if these containers are made available they will be able to export large quantity of canned fish. The can making industries are reluctant to go in for these containers because of the huge investment and uncertainty of demand estimate.

Canned Fruit and Vegetable Products

The production of fruits and vegetables in the country is estimated to be of the order of 3.2 crore tonnes per annum. About 20 per cent of the total production is wasted for lack of transport, storage and processing facilities. Seasonal glut following the harvest leading to a low return to the farmer is one of the factors inhibiting increase in production of fruits and vegetables.

The annual wastage is estimated to be of the order of 60 lakh tonnes of fruits and vegetables valued at Rs 300-350 crores. An effective answer to this problem is the processing/canning of surplus stocks during the season.

There are 32 units engaged in the manufacture of processed foods with an installed capacity of 97,869 tonnes per annum. Further licences for a capacity of 16,838 tonnes per annum have been issued. An additional capacity of 47,682 tonnes per annum is covered by letters of intent.

The regional distribution of the units is given below:

Fruit and Vegetable Products

State	No. of Units	Capacity approx. in tonnes
Assam	1	1,472
Bihar	1	4,438
Madhya Pradesh	1	20,730
Gujarat	1	4,438
Uttar Pradesh	1	1,472
Punjab	1	2,945
Tamil Nadu	1	20,730
West Bengal	1	1,472
Karnataka	1	1,472
Kerala	1	1,472
Goa	1	1,472
Andhra Pradesh	1	1,472
Kerala	1	1,472
West Bengal	1	1,472
Tamil Nadu	1	1,472

The production during the last three years was as follows:

Year	Quantity
1971	25,281 tonnes
1972	24,738 tonnes
1973	27,888 tonnes

The utilisation of capacity is around 45 per cent.

Substantial quantities of processed fruits are being exported. The exports during 1971-72 and 1972-73 were valued at Rs 2.8 crore and Rs 4 crores respectively.

It is estimated that the demand for 1974-75 for processed fruits and vegetables will be around 100,000 tonnes per annum. In order to meet this demand an installed capacity of 20,000 tonnes per annum will be required. There are good export prospects. In view of the above, there is considerable scope for creation of additional capacity in this field, particularly in the processing of large volume of production of fruits and vegetables. The estimated cost of a unit for all types of processed fruits and

vegetables would be around Rs 100 lakh per annum involving a capital investment of Rs 50 lakh.

Most of the plant and equipment for this industry like juice extractors, pulping machines, etc. are available from indigenous sources. Some of the specialised machinery required for the industry especially for the manufacture of frozen fruits, frozen juices, etc. may have to be imported.

Development Scheme for Kook.

The Kook Agro-Industries Development Foundation has formulated a scheme for the development of this cottage industrial industry in backward regions.

The Rs 1.5 crore plan envisages establishment of nearly 20 big and small units and agro-based industrial projects on a 300 acres of land.

The projects included in the scheme are: fruit processing, vegetable processing, milk products complex and chemical factory, etc. Installation of agro-machinery and its accessories.

During the first phase of the development scheme, it is proposed to acquire 100 acres of land from the Government Mahan in South Rajasthan and to about 20 projects within a year. It is expected to be completed by May 1975.

The Foundation expects to receive a 15 to 20 per cent of the net income of the units as grant from the Union Government. It is also expected to get some from the State Government, financial institutions, regional development, corporate organisations, associations and industries.

West Bengal: IDA Credit

A Credit of \$14 million from the International Development Association (an affiliate of the World Bank) will be

...an agricultural development project
igned to increase foodgrain production,
income and rural employment in
la's West Bengal State.

he project will support a four-year
programme of investments to improve
for irrigation, agro-service centres for
distribution of inputs, regulated
kets, and agricultural extension services.
Agricultural Refinance Corporation
(C) and the Government of West Bengal
be the channel for IDA funds.

West Bengal has about 8 per cent of
tia's population on less than 3 per cent
land. Agriculture accounts for almost
per cent of the state's income and 60

per cent of the jobs. Like other states in
India, West Bengal has given priority to the
development of agriculture.

The major benefits resulting from the
project will be additional production of
310,000 tons of foodgrains a year worth \$50
million, and the generation of about 100,000
man-years of labour per year, in an area
where unemployment is a serious problem.
About 200,000 farmers will benefit directly
from the project. About 75 per cent of
these will be small farmers.

The project is scheduled to be completed
in 1979 at a total estimated cost of \$67
million. The IDA credit will meet about
51 per cent of the cost of the project.

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Export News

- Introduction of Direct Sailing Facility
- Chain Contracts for Export not exempt from sales tax
- Mango Slices
- Ethiopia

Introduction of Direct Sailing Facility

The Shipping Corporation of India will offer direct sailings every alternate month at George Town in Guyana and Port-au-Prince in Trinidad to their vessels serving Calcutta-ES and east trade. The cargo bound for other neighbouring Latin American countries could take advantage of these new facilities. The expenses are to be borne by the office of the Shipping Corporation of India Limited Calcutta. The further details regarding the new scheme the sailing will commence, will be required for forwarding.

Ministry of Commerce, New Delhi, India No. 25/1/74 FT (N) dated 28.2.1974.

Chain Contracts for export not exempt from sales tax

Chain contracts (commercially known as back-to-back contracts) with the intention of selling goods for the export of various items from the country cannot escape the tax imposition in the event they are treated as contracts for the 'export of goods' and will not be exempt from sales tax, according to

a majority decision given by the 2nd Court in a chronic and export case.

Till now the law on this point was quite clear. The general view was that sale by one local party to another local could also be for the purpose of export except from sales tax if the latter was on the same terms. The present decision is a real all double on the

Mango Slices

Attention of the trade is invited to offer Export Trade Notice No. 25/74 28-2-1974 on the above subject.

It has been decided by the Ministry of Commerce that during the two period April 1975-March 1976 export Mango Slices in Bins and Mugs in Vessels will be allowed freely and bills to all permissible destinations categories of exporters.

(Trade Notice No. 25/75 dated 10 April 1975).

Ethiopia

The Shipping Corporation of India the Mafraq Lines will provide bi-monthly sailings from the east and coast of India to Ethiopian ports services figure in the new schedule of port services related to the Shipping Corporation of India. Regular routes Calcutta and Bombay to the Ethiopian will enable local importers of goods to receive their shipments quickly than in the past.

Foreign News

U.S.A.—World Bank Lending Rate

Rome—World Rice Production

*Atomic Energy and World Food
Food Security*

Holland—Naarden International

Lebanon—Imports and Exports

Libya—Developments

Philippines—International Rice Research Institute

Peru—External Payments

Sudan—Developments

Tanzania—World Bank Assistance

Singapore—Import of Oranges and Apples

U.S.A.

World Bank Lending Rate

The International Bank for Reconstruction and Development (World Bank) has increased the rate of interest charged on loans to its borrowers from 8 per cent to 12 per cent per annum. The increase affects loans committed by the Bank on or after February 1, 1975. The decision to increase the lending rate was taken by the Bank's Management subsequent to a regular six-monthly review of financial policy by the Executive Directors representing 125-member countries of the Bank.

ROME

World Rice Production

The Food and Agriculture Organization (FAO) reports that world rice production in 1974 declined by 3 million tons due to unfavourable weather, particularly in the Far East, the major rice producing region.

The shortfall was concentrated in the importing countries.

The FAO Inter-Governmental Group on Rice consisting of rice exporters from 40 countries which met in Rome concludes that with world export availabilities are larger than in 1974 and part of the import demand diverted to less expensive cereals such as wheat, the export supply and import demand situation for rice in 1975 seemed to be more in balance than in the previous two years. The world reserve stocks of rice were unlikely to be replenished to any appreciable extent this year.

The Group agreed poor crops due to bad weather, dwindling stocks and the tight supply situation of other cereals, together with inflationary pressures, have pushed rice prices in the world market to unprecedented heights in 1974, making rice much more expensive in relation to other cereals resulting in the decline of world rice trade.

Atomic Energy and World Food

ATOMIC energy technology offers unique ways of looking into and solving agricultural problems.

The application of nuclear science in agriculture is concentrated in six major areas. International activity in this field is supervised by two United Nations organizations working together as the Joint Food and Agriculture Organization International Atomic Energy Agency (FAO/IAEA), Division of Atomic Energy in Food and Agriculture.

The use of isotopes and radiation in agriculture are used to increase production, improve the quality of food, protect farm and fishery products from spoilage and losses, and minimize the pollution of food and agricultural environment.

Emphasis in the implementation of the programme is placed on the achievement of agricultural sufficiency in the developing countries, and on international collaboration. This is done through more than 20 co-ordinated research programmes comprising about 200 funded contracts as well as 'cost free' agreements with research institutes in the countries concerned.

Studying soil fertility and the effectiveness of irrigation are two of the many practical areas where the nuclear scientist can help the farmer. By labelling a nutrient element in a fertilizer with a stable or radioactive isotope, it is possible to follow its fate in the soil, and its absorption by the plant. Such studies have been made with rice, wheat, maize, grain legumes and the tree crops banana, citrus, cocoa, coffee, coconut and oil palm, in most of the developing countries.

Much of the next decade's work will be concentrated on the conservation of soil and of scarce water and fertilizer resources; increased research into multiple cropping or inter-row cropping is also foreseen, as well as their inter-relationship with disease and insect control.

Studies are being carried out by means of isotopic tracers to improve the productivity of cattle, sheep, pigs and poultry, while another project assesses the suitability of different herbivorous species to produce meat and/or milk in wet and dry tropical environments. A regional programme stretching across the buffalo belt in Asia and Africa is planned to study milk production in buffalo to achieve a higher level of productivity based on locally available foodstuffs.

A draft agreement to undertake collaborative fish irradiation studies is at present being considered as the first project under an IAEA-sponsored Regional Agreement for Research Development and Training

related to Nuclear Science and Technology (RCA) in South and South-East Asia and the Far East.

Fish and fishery products constitute 10—20 per cent of the total protein consumption, and 50—70 per cent of the animal protein consumption of the population of the 17 member states of the region. Around one-third of the world's population (ca. 1000 million people) live in these 17 countries (Afghanistan, Australia, Bangladesh, Burma, India, Indonesia, Japan, Khmer Rep., Malaysia, New Zealand, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Viet Nam). The serious deficiency in animal protein consumption in this region, and other areas such as Africa, could, at least partially, be remedied by preservation of the fishery catch in order to reduce the tremendous losses presently occurring during handling, transport and storage of this highly perishable commodity, and in order to make it available to inland populations who are almost quite cut off from this protein source at present.

Food Security

The Council of the Food and Agriculture Organization (FAO) reports that some aspects of the food situation have improved but the world continues to live from season to season and world food security is still a distant goal. The 42-nations Council, the FAO's interim governing body, at an extraordinary session to take follow-up action to last November's United Nations World Food Conference, noted that, while crop prospects for 1975 seemed favourable world cereal production had fallen in 1974 for the second time in three years, leaving stocks seriously low.

Per capita food production in the developing countries was lower in 1970. Though widespread starvation had been averted, the number of severely malnourished people

had increased beyond the 460 million estimated by the FAO to have been affected in 1970.

The high prices of food and fertilizers had brought on severe hardships for poorer consumers. Many donor countries have increased their commitments for financial and technical assistance for fertilizer production in the 'third World'.

One outcome of the World Food Conference was the creation of the World Food Council, with membership on the ministerial level, whose principal aim would be to follow up on decisions adopted at the Conference. A. Hannah, Executive Director of the World Food Council, said that the World Food Council's role was 'to co-ordinate the activities of all the agencies of United Nations system in increased food production, particularly in the food deficit countries, and on nutrition, food security, food trade, food aid and related matters'.

HOLLAND

Naarden International

Naarden International N. V. Group sales totalled Fl. 285.7 million (1973: Fl. 236.3 million), an increase of 20.9 per cent (1973: 14.1 per cent). Consolidated net profit, after deduction of the directors' share, improved by 26.1 per cent (1973: 22.1 per cent) to Fl. 8 million (1973: Fl. 6.3 million). Shareholders will be offered a choice between a cash dividend of Fl. 2 (1973: Fl. 1.80) per Fl. 10 share and a stock dividend, chargeable to the share premium account, of one new share for every thirteen shares held (1973: one for fifteen).

Sales of fragrances and flavours rose by 18.4 per cent (16 per cent) to Fl. 226.2 million (Fl. 191.1 million). Demand for the products of the Chemicals Division increased substantially under the influence of the shortage of raw materials, and this

was reflected in an improvement of 31.5 per cent in sales (1973: 6.6 per cent).

In Europe, the operating companies in Germany, Belgium and Norway, in particular, can look back on 1974 with satisfaction. The Naarden companies in the United States, Australia, Mexico, Argentina and Indonesia all achieved significant growth. The American operation is now on the right heading. Convinced of the value of this market, Naarden will not hesitate to increase expenditure and investment there if this proves necessary.

Investment in fixed assets in 1974 totalled Fl. 13.3 million, compared with Fl. 9.8 million in the previous year. The figure for 1975 is estimated at Fl. 18.5 million. The principal projects are the construction of a plant for compounding perfumes and an effluent treatment installation in the Netherlands, and new premises for the operating company in the United Kingdom. Expenditure on research and development throughout the Group represented approximately 7 per cent of the consolidated turnover in fragrances and flavours.

Barring a worsening of the present recession, Naarden International confidently anticipates further growth of earnings in the current year, albeit sales and profit in the first half are not expected to exceed the exceptional level achieved in the corresponding period of 1974. This confidence is in part based on the fact that fragrance and flavour play a role in the basic necessities of life and are thus less sensitive to movements in the economy. In addition, the Group derives clear benefits from the policy of spreading its operating companies over the five continents.

LEBANON

Imports and Exports

The Ministry of Agriculture has banned the import of bananas into Lebanon with effect from the 17th August 1974.

The export and import of agricultural products in Lebanon are restricted to prior licensing as from the 2nd September 1974.

A directive has been issued by the Bank of Lebanon to the commercial banks, authorising them to request applicants for letters of credit (LC) to deposit in cash, 15 per cent of the value of the letters of credit in the currency used for payment.

The Food and Agriculture Organisation (FAO) and the U.N. Economic Commission for Western Asia (ECWA) will open a joint agricultural office in Beirut in 1975. The primary aim of the proposed office is to co-ordinate efforts between the two international organisations in implementing agricultural projects in the region.

LIBYA

Developments

The Government has constructed two centres for Breeding Milch Cows in Mis-tatha Governorate. These will be in addition to the two existing centres.

The Government has issued an order for the construction of a Green Agricultural strip at Benghazi and Ajudabia. The project will cost 1.3 million dinars and has been included in the three years Development Plan commencing this year. This will be maintained by a Special Executive Committee.

New Foodstuff Industries will be established in Sebha in the Fezzan. Preparations are in progress for the establishment of a tomato canning factory with a capacity of 7,000 tons and a wheat mill with 25,000 tons of soft wheat per annum.

A number of contracts were signed in Shehat for drilling water wells at a cost of 190,000 dinars. Contracts worth 18,865,912 dinars were signed for execution of Development Projects in Ajudabia for expansion of water net works, construction of local

markets, slaughter houses, building of summer resorts and illumination of streets.

4,000 beehives were imported from Italy. More beehives are to be imported with a view to reach self-sufficiency in honey production.

PHILIPPINES

International Rice Research Institute

Agricultural research in Asia will be strengthened with the approval by the Asian Development Bank of a technical assistance grant to the International Rice Research Institute (I.R.R.I.) for the expansion of its research and training facilities at Los Banos, Laguna, Philippines.

Founded in 1960, this is the first expansion of physical facilities to be undertaken by I.R.R.I. Under its programme, additional 150 hectares of land will be developed, new laboratory facilities and a new training and conference centre will be constructed.

The estimated total cost of the expansion programme is about US \$2.9 million. Funds for the construction of the new facilities will come from donors represented on the Consultative Group for International Agricultural Research of which the Bank is a member, while the Bank's contribution of US \$300,000 will be used for the procurement of laboratory and training equipment. The additional land is to be provided by the Philippines Government.

I.R.R.I. has a unique record of achievement and has produced what has been popularly known as the 'miracle rice'. I.R.R.I. furnishes the necessary physical facilities for rice research and provides Asian extension workers, farm managers and researchers an excellent opportunity to obtain training in modern techniques of rice production. One advantage that I.R.R.I. has over other centres is its close proximity to the College of Agriculture of the University of Philippines. Joint programme with the university

permits the combining of a formal education with practical training.

The investment programme of I.R.R.I. has the objective of intensifying and further systematizing and integrating rice research efforts and enlarging the training facilities of the Institute.

With regard to research an expanded and systematized 'genetic evaluation and utilization programme will be undertaken to further explore the genetic potential of rice plant for higher yield, pest and disease resistance and tolerance of adverse ecological conditions. Another aspect to be intensified is cropping systems research to facilitate fuller utilization of land in rice-growing areas.

The expansion of research and training facilities is considered crucial for the sustained improvement of rice cultivation and production in Asia.

PERU

External Payments

Notice No. 11-74 of the Private Sector Transactions Board provides for the relaxation of the regulations on the 180 day financing arrangement introduced in May.

1. (a) Foodstuffs and pharmaceuticals are exempt from all necessity of finance; (b) Intermediate and/or finished products are subject to financing of not less than 90 days; (c) Other products are subject to financing at 120 days.

2. Imports whose C.I.F. value does not exceed the sum of US \$ 5,000 per shipment, and up to a maximum of US \$ 50,000 per year, are exempt from necessity of financing.

3. In addition to the exception from financing deal within the previous paragraph, imported goods to a value not exceeding US \$ 2,000 C.I.F. per ship-

ment are exonerated from the necessity of obtaining documentary credit or letter of guarantee.

SUDAN

Developments

The Sugar Administration emphasised determination to achieve substantial progress in the field of sugar development. 1976-77 would not only be a year of self-sufficiency, but would also mark the start of exports. In 1977, the Sudan will produce 500,000 tons of sugar. In 1976, North West Sennar sugar factory would be in production of 110,000 tons annually and in 1977, the Haggar Asalaya and Mallut sugar factories would start production of 110,000 tons each. It is expected that in 1977 the Mangala sugar factory would also start to produce 50,000 tons annually. These factories together will produce 380,000 tons annually in addition to the production of 120,000 tons by the existing two factories at Khash El Firba and Guneid. The total production will come to 500,000 tons. 270,000 tons will be needed for internal consumption, leaving a surplus for export.

A Sudanese delegation led by the Chairman, Sugar and Beverage Corporation, visited Belgium to hold technical discussions on specifications and to finalise contracts to import the equipment required for Mallut sugar factory.

Sudan has two major agricultural projects for which the Government is seeking financial assistance from the Arab and International Organisations. The first project concerns (i) mechanised farming of crops and (ii) oil seeds and animal production. The second one is for production of vegetable, fodder and meat. The Arab Organisation for Agricultural Development has made technical and economic

studies of these projects. The organisation has also expressed economic viability of the meat production project being set up at a cost of L.S. 8.7 million. The Director of Kenaf project visited Austria and Italy to arrange import of 130 tractors from Austria for the Tong Kenaf scheme. He had a talk in Italy for the import of equipment for Abu Nania Kenaf factory. In order to reduce import of concentrated juice, the Government is taking steps to cultivate tomato plantations over 700 feddans to meet local requirements of tomato paste.

The Government signed an agreement on 17th September 1974 with Denmark for the establishment of a dairy farm in Juba which would be set up with the first Danish loan. The project will cost £ 130,000 and will produce 5,000 litres of milk daily.

It has allocated a sum of L.S. 250,000 for Naba Lake Fishery scheme. This project is being implemented in terms of the technical and economic co-operation between Sudan and China. Designs for ice factory, a maintenance workshop and trailers are being made in China.

TANZANIA

World Bank Assistance

The World Bank Group has to date approved loans totalling \$36.7 million to the United Republic of Tanzania for the fiscal year ending 30 June 1975. Two further projects, including a dairy development project are being appraised and would bring total Bank Group assistance to the United Republic of Tanzania to \$100 million for the current fiscal year. This would double the Group's lending to Tanzania in the fiscal year 1974, and compares with the present total of \$170 million in loans to Tanzania by the Bank since 1962.

During the current fiscal year, the Bank and its soft loan affiliate, the International Development Association (IDA), approved loans and credits of \$8.5 million for a National Site and Services Project; \$6.2 million for highway improvement; \$17 million for the Kilimanjaro Rural Development Project; \$18 million for the Kilimbero Sugar Project; and \$1 million to provide foreign exchange for essential imports.

The Site and Services project, loaned by IDA, will assist Tanzania's low-cost housing programme by developing 100 newly-serviced plots and helping squatters to improve nearly 8,000 dwellings on the Salama, Mwanza and Mbeya. Community facilities and infrastructure will also be provided.

SINGAPORE

Import of Oranges and Apples

Singapore imported more than \$20 million worth fresh mandarin oranges in 1974. This amounts to 40,850 tonnes fresh mandarin oranges. The main source of supply is Israel which exported \$9 million (11,404 tonnes of oranges). Taiwan \$3.9 million (7,354 tonnes), China \$4 million (8,906 tonnes), United States \$3 million (5,443 tonnes) and Australia \$4 million (5,443 tonnes); India's share is \$1 million.

Singapore also imported 21 million (20,496 tonnes) of apples last year. The main source of supply is Australia (10,900 tonnes) \$11 million, China \$4.7 million (10,393 tonnes) and New Zealand (2,000 tonnes) \$2 million.

Singapore in turn re-exported 6.5 tonnes of apples worth \$4.5 million to 11,304 tonnes of oranges worth \$5.5 million to West Malaysia, Sabah and Brunei.

Trade Marks

(Trade Marks accepted by the Trade Marks Registry)

Name and address of applicant	No. and Date of the Trade Marks Journal publishing the Trade Mark	Official No. of Trade Mark	Date	Products	Trade Mark
Food Products Pvt. Ltd., Chowpule House, Mormugao Harbour, Goa	612/1-3-1973	284,524B	5-12-1971	Canned and dried fruit and vegetable jellies for food, jams and puddings for sale in the State of Goa	Prince (Class 29)
ers and Company Private Limited, 18, Bare Road, Byculla, Bombay 2	612/1-3-1973	292,199	19-11-1973	Non-alcoholic aerated and non-aerated beverages	Rogers Beverages (Class 32)
ustan Milkfood Manufacturers Limited, Anulaya House, 23, Easturba Gandhi Marg, New Delhi	620/1-4-1973	292,521B	12-11-1973	Malted milk for food and food preparations prepared from milk included in class 29	Bruno (Class 29)
thern Sea Foods Private Limited, 15, Fortieth Road, Madras	621/1-4-1973	289,176	4-7-1973	Frozen and canned shrimps (Prawns)	Monarch (Class 30)
eroi Hotels India Private Limited, Oberoi Gardens, Alipur Road, Delhi	621/1-4-1973	279,841B	28-4-1972	Food products for human consumption included in class 30	"S" (Class 30)
Canada Limited, 790, Bay Street, Toronto 22, Ontario, Canada	621/1-4-1973	279,789	27-4-1972	Sauces, vinegar, cereals (for food), honey; food preparations included in class 30	IGA (Class 30)
a Production and Research Association Private Limited, Parvha Industrial Area, Bareilly, Uttar Pradesh	622/1-5-1973	289,287B	10-7-1973	Food products included in class 30	Proteinac (Class 30)
ra District Co-operative Milk Producers' Union Limited, Anand Gujarat State	623/16-5-1973	298,679	26-8-1974	Milk based beverages included in class 30	"Bal Anand" (Class 30)

Government Notifications

- *Development Council for Food Processing Industry*

Shri Amrut Vithaldas Mody

Shri Ramesh Chauhan

Shri Vajram Setty

Shri S. P. Chauhan

Shri Prem Pandhi

Shri P. Gangadharan Pillai

Shri A. K. Agarwal

Shri S. P. Virmani

- *Members of the Central Committee for Food Standards*

- *Utilisation of Release Orders*

- *Export Houses*

- *Finalisation of Drawback Claims*

- *Payment Against Imports from Poland*

- *Export of Gur and Khandasari Sugar*

Development Council for Food Processing Industry

In exercise of the powers conferred by Section 6 of the Industries (Development and Regulation) Act, 1951 (65 of 1951) read with rules 2, 4 and 5 of the Development Councils (Procedural) Rules, 1952, from the date of this order, the following persons to be members of the Development Council for the scheduled industries engaged in the manufacture or production of Food Processing Industries in place of members appointed under the late Ministry of Industrial Development Order No. S.O.2757/IDRA dated the 14th July 1971, as amended from time to time, whose term of office has expired by efflux of time or otherwise:

1. Dr V. Kurien, Chairman and Managing Director, Gujarat Co-operative Milk Marketing Federation Limited, Anand, Gujarat.

2. Shri A. V. Mody, Managing Director, M/s Unichem Laboratories Ltd., 22, B. Desai Road, Bombay.
3. Shri Chinubhai Manibhai, Technical Director, M/s Anil Starch Products Ltd., Anil Road, Ahmedabad.
4. Shri S. P. Virmani, M/s Jawala Flour Mills, 33, Najafgarh Industrial Area, New Delhi.
5. Shri S. P. Chauhan, Commercial Manager, M/s Parle Products Private Ltd., 254-B, Dr Annie Besant Road, Bombay.
6. Shri N. Vajram Setty, M/s Kwalitty Food Products, Mysore Road, Bangalore.
7. Shri P. R. Ramakrishnan, M/s Jey-pore Sugar Company Limited, 6/34, Race Course Road, Coimbatore.
8. Dr K. T. Achaya, Executive Director, Protein Foods and Nutrition Development Association of India, Mahalaxmi Chambers, 22, Bhulabhai Desai Road, Bombay.
9. Shri L. P. Jaiswal, Chairman and Managing Director, M/s Jagatjit Industries Limited, 54, Ring Road, Lajpat Nagar-III, New Delhi.
10. Shri A. K. Agarwal, Director, M/s Foremost Dairies Ltd., Kailashpur, Saharanpur (U.P.).
11. Shri V. B. Oberoi, M/s Kissan Products Limited, Post Bag No. 1676, Bangalore-560016.
12. Shri Iqtadar Husain, M/s Asian Dehydrates Ltd., 3rd Floor, 221, Dr Dadabhai N. Road, Bombay-1.
13. Shri N. J. Chacko, Director, M/s Kerala Food Packers, W-22/189, Alleppey (Kerala).

14. Major General R. N. Mehra, M/s Rani Shaver Poultry Breeding Farm (P) Ltd., D-324, Defence Colony, New Delhi-24.
15. Shri Ramesh Chauhan, Managing Director, M/s Parle (Exports) Pvt. Ltd., Western Express Highway, Andheri (East), Bombay.
16. Shri P. Gangadharan Pillai, M/s Kerala Nut Food Co., 588 (Eastern Block), Residency Road, Askamom, Quilon-2.
17. Shri Prem Pandhi, Director, M/s Metal Box Company of India Ltd., Allahabad Bank Building, 17, Parliament Street, New Delhi-1.
18. Dr (Smt.) Rajammal P. Devadas, Principal, Sri Avinashilingam Home Science College for Women, Coimbatore-641011.
19. Shri Jag Parvesh Chandra, Deputy Chairman, Metropolitan Council, Old Secretariat, Delhi-6.
20. Shri M. Narasimha Rao, Secretary, Andhra Pradesh Trade Union Congress, Gandhi Nagar, Kovvur, West Godavari Dt., A.P.
21. Shri Vidya Dhar Bajpai, Member of Parliament (Lok Sabha).
22. Shri D. D. Puri, Member of Parliament (Rajya Sabha).
23. Mrs K. P. Leela Nayar, Director (Food), Office of the Development Commissioner (Small Scale Industries), New Delhi.
24. The Agricultural Marketing Adviser to the Govt. of India, Ministry of Agriculture, Faridabad.
25. Dr P. K. Kymal, Director, Ministry of Agriculture, Department of Food, New Delhi.
26. Shri D. S. Chadha, Secretary, Central Committee for Food Standards,

Dte. General of Health Services, New Delhi.

27. Shri J. G. Rajadhyaksha, Deputy Secretary, Ministry of Industry and Civil Supplies, Department of Industrial Development.
28. Shri S. Ramaswamy, Officer on Special Duty (Food Directorate), Directorate General of Technical Development.

Shri S. Ramaswamy, Officer on Special Duty, Directorate General of Technical Development, New Delhi, is hereby appointed to carry on the functions of Secretary to the said Development Council.

Shri Amrut Vithaldas Mody



Shri Amrut Vithaldas Mody graduated from Wilson College, Bombay and took M.Sc. from the London University. He is the Chairman and Managing Director, UNICHEM Laboratories Limited, Bombay.

Shri Mody is the recipient of Padma Bhushan award which was conferred on him by the President on 26th January 1973. He is also the recipient of Acharya P. C. Ray Gold Medal of the Indian Pharmaceutical Association, Calcutta.

Shri Mody is the Chairman and Director of Biological Evans Ltd., Hyderabad; Uni-sankyo Ltd., Hyderabad; UNI-UCB Private Ltd., B. C. Mody Export Private Ltd., Blownmould Containers Pvt. Ltd., Triochem Products Pvt. Ltd., Bombay; Aroor Chemicals Private Ltd., and Cochin Pam Pvt. Ltd., Cochin. He is Chairman of Pharmaceutical and Drug Research Committee, CSIR, New Delhi; Board of Trustees, Bombay; Maharashtra Board for Export Promotion, Chemicals, Drugs and Pharmaceuticals, Government of Maharashtra and Vice-Chairman, Basic Chemicals, Pharmaceuticals, Soaps Export Promotion Council, Bombay. He is Member, Pharmacy Council of India, New Delhi; Executive Committee, Central Drug Research Institute; Development Council for Drugs and Pharmaceuticals, Government of India; Executive Committee, Institute of Toxicology; State Advisory Council of Industries, Government of Maharashtra and Rotary Club of Bombay. He is the Vice-President, The Bombay Social Hygiene Council; Ex-President, Indian Pharmaceutical Association; Indian Pharmaceutical Congress and Ex-Chairman, Development Council for Drugs and Pharmaceuticals, Ministry of Industry, Government of India.

Shri Ramesh Chauhan

Shri Ramesh Chauhan is the Managing Director, Parle (Exports) Pvt. Ltd., Bombay.

Born on 17th June, 1940, Shri Chauhan assumed the role of Managing Director of Parle (Exports) Private Limited, formerly Parle Bottling Company, at the age of 34. He took B.Sc. degree in Mechanical Engineering from the Massachusetts Institute of Technology, before returning to India to join his father in business.

Shri Chauhan is actively engaged in establishing franchises for Limca and Gold



Spot in overseas markets. His efforts bear fruits when Gold Spot was taken up by Dacca (Bangladesh) entrepreneur, and Pepsi-Cola bottler in Mauritius took a franchise for Limca. Three other franchises will begin operations abroad in 1975; more are on the offing.

Shri Chauhan's knowledge is not restricted to any one field. Apart from engineering background and the marketing skills he has developed over the years, he is always initiating research and development of new concepts within beverage industry. The result is the wide range of exciting new Parle-like products await early launches both in India and abroad.

Shri Vajram Setty

Shri Vajram Setty is the proprietor of Kwaliti Food Products, Bangalore. He started Kwaliti Food Products in 1965 as an offshoot of their family group under banner of Gowrishankar Industries which included textiles and soaps.

Shri Setty has travelled widely and himself got trained in Holland and in European countries to acquaint him with the machinery he bought for his plant.



The next phase of the expansion is on with a view to doubling the capacity of their famous Glucos, Teatime, Golden and Vin biscuits.

Shri S. P. Chauhan



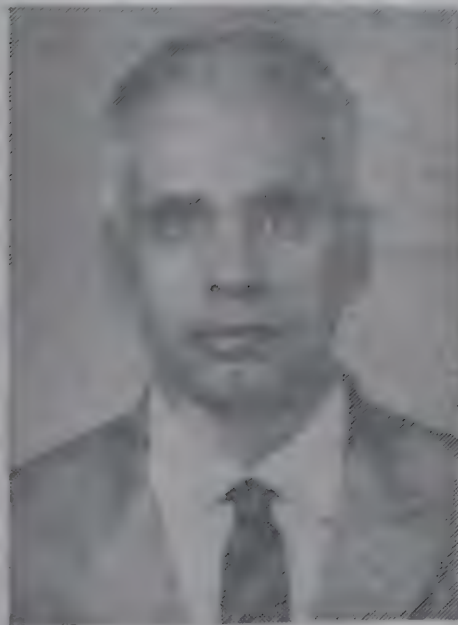
Shri S. P. Chauhan is the Commercial Manager, Parle Products Pvt. Ltd., Bombay.

Shri Chauhan completed Industrial Management and also Electrical Engineering from the Massachusetts Institute of

Technology, U.S.A. In 1966, he joined Parle Products Private Limited, Bombay. He is now in charge of Commercial, Finance and Marketing operations.

Shri Chauhan is the President of the Indian Confectionery Manufacturers' Association and Vice-President of Biscuit Manufacturers of India.

Shri Prem Pandhi



Shri Prem Pandhi is Director, The Metal Box Company of India Limited, New Delhi.

Shri Pandhi did Master's degree in History and Bachelor's degree in Teaching and also did Preliminary Examination in Law from the Punjab University. In addition to academic qualification he has done Senior Executive Course at the Administrative Staff College of India, Hyderabad; Senior Management Programme at Syracuse University, New York; International Executive Course at Centre D Etudes Industrielles, Geneva.

Shri Pandhi has taught at the Aitchison Chief College in Lahore during 1943-45. Later he joined as Branch Sales Manager

with the Associated Cement Co. of India Ltd., Bombay, where he worked till 1954. He worked in various capacities with the Dunlop Company of India between the years 1955 and 1963. Thereafter he joined the Metal Box Company.

Shri Pandhi is the Director and Vice-Chairman, local Board of Reserve Bank of India for Northern Area; Member of the Executive Committee, Indian National Committee of the International Chamber of Commerce; Member of the Government Body of the Central Board of Secondary Education, Government of India; Member of the Government Body, Shri Ram College of Commerce; Member, General Council of Institute of Applied Manpower Research (1966-1969); Chairman, Punjab, Haryana and Delhi Chamber of Commerce and Industry (1966-1973); Chairman, Indian Engineering Association (Northern Region) (1968-1969); Member, Planning Commission Committee on the Development Programmes for Packaging Industry in the Fourth Plan; Member, Committee on Export Packaging (1969) appointed by the Ministry of Foreign Trade, Government of India; President, Delhi Management Association (1969-1970); Council Member, Institute of Office Management—India since 1967; Council Member, All India Management Association; Member, Advisory Council, Department of Business Management and Industrial Administration, Delhi University, since 1967.

Shri Pandhi has taken keen interest in sports right from his youth. Aged 56, he still continues to take active interest. Between 1938 and 1950, he was ranked among the first six top tennis players of India and has represented the country in a number of international fixtures. He was the Honorary Secretary of Delhi Lawn Tennis Association (1952-56); Chairman, Tennis Association (1966-1967) and President, International Lawn Tennis Club of India, since 1972.

Shri P. Gangadharan Pillai

Shri P. Gangadharan Pillai is the Proprietor, Kerala Nut Food Company, Quilon.

Born on 10th June 1925 at Quilon, he graduated from St. Xavier's College. He joined his father's business in 1944. He is one of the leading Cashew Processors, Exporters of Cashew Kernels, Cashewnut Shell Liquid, Coffee, Pepper and Hill Produce and importers of Raw Cashewnuts.

Shri Gangadharan Pillai is the Director of Kerala Shipping Corporation Limited, Cochin; Poyilakada Fisheries Private Limited, Quilon; Superior Oxygen Limited, Bangalore; Bangalore Cables Limited, Bangalore and Hill and Marine Products (Export) Limited, Bangalore.

He is on the Managing Committee of the Cashew Export Promotion Council, Cochin; and Federation of India Exporters Organisation, New Delhi. He is a Member of Kerala Sai Trust, and Mannom Trust. He has been taking keen interest in the development of Rubber Plantations, Fisheries and Vine.

Shri Gangadharan Pillai has travelled widely on export promotion.

Shri A. K. Agarwal

Shri A. K. Agarwal, Director, Foremost Dairies Limited, Saharanpur and Indodan Milk Products Limited, Muzaffarnagar, U.P., has been nominated Member, Development Council for Food Processing Industries by the Ministry of Industrial Development, Government of India.

Born on 12th January 1944, he had his initial education from Hindi High School and graduation from St. Xavier's College, Calcutta. After completing his training at Indodan Milk Products Limited he was appointed overall in-charge for setting up Dairy Plant at Saharanpur which was commissioned in 1972. He also undertook the innovation and expansion of condensed



did his B.A. (Hons.) of Punjab University in 1932 from Government College, Lahore. Shri Virmani is the President of Northern India Flour Mills Association, Amritsar; Punjab Federation of Industry and Commerce, Amritsar and Chairman of Shri Swami Satyanand Dharmarth Trust, New Delhi; S. P. Virmani Public Charitable Trust, New Delhi. He had been President of Roller Flour Millers' Federatoin of India, New Delhi; Factory Owners' Federation, New Delhi; Northern India Cotton Textile Mills Association, New Delhi; and Punjab, Haryana and Delhi Chamber of Commerce and Industry, New Delhi.

Shri Virmani served as District Governor, Rotary International District 310. He has visited several countries. On two occasions he was Adviser to the Indian Delegation to the International Wheat Conference held in Geneva. Shri Virmani has been a Director of The Reserve Bank of India, State Bank of India and the Industrial Finance Corporation of India. He is also Director of several companies.

milk plant at Muzaffarnagar. Both the plants at Saharanpur and Muzaffarnagar are producing Skimmed Milk Powder, Butter, Ghee, Condensed Milk, Baby Food, Whole Milk Powder and Sweet Candy.

Shri Agarwal is a Member, Executive Committee, Western U.P. Chambers of Commerce and Rotary Club, Muzaffarnagar.

Shri S. P. Virmani



Members of the Central Committee for Food Standards

1. Dr J. B. Shrivastav, Director-General of Health Services—*Chairman, Ex-officio.*
2. Dr B. R. Ray, Director, Central Food Laboratory, 3, Kyd Street, Calcutta 16.
3. Dr B. L. Amla, Director, Central Food Technological Research Institute, Mysore-13.
4. Shri D. S. Chadha, Secretary, Central Committee for Food Standards, Dte. Genl. of Health Services, New Delhi.
5. Shri F. G. T. Menezes, Director (Vanaspati), Dte. of Sugar and Vanaspati (Dept. of Food), Min. of Food and Agriculture, Krishi Bhavan, New Delhi.

Shri S. P. Virmani is the Managing Director of M/s S. P. Virmani and Son Pvt. Ltd., 33 Shivaji Road, Najafgarh Industrial Area, New Delhi-15. Born on 23rd September 1913 in Lyallpur, now in West Pakistan, he

6. Shri T. V. Mathew, Director, Central Agmark Laboratory, Nagpur.
7. Shri S. Ramaswamy, Officer on Special Duty (Food), Dte. General of Technical Development, Udyog Bhavan, New Delhi.
8. Col Seetaram, Deputy Director (Food Inspection), Q.M.G. Branch, Army Headquarters, New Delhi.
9. Shri K. B. Balasubramanyam, Deputy Director, Ministry of Foreign Trade, Government of India, New Delhi.
10. Dr S. S. Verma, Director, Health, Railway Board, New Delhi.
11. Col. S. L. Chadha, Municipal Health Officer, Delhi Municipal Corporation, Delhi.
12. Dr Costa Frias, Drugs Controller, Department of Health Services, Panaji (Goa).
13. Dr (Smt) Kamala Sohonie, Chairman, Consumer Guidance Society, Hutment 'J', C Mahapalika Marg, Opp. Cama Hospital, Bombay-1.
14. Dr S. G. Srikantia, Deputy Director, National Institute of Nutrition, Hyderabad.
15. Dr T. Purnanandam, Director, Dte. of Agriculture and Food Division, Indian Standards Institution, 9-Bahadurshah Zafar Marg, Manak Bhavan, New Delhi.
16. Dr (Miss) K. Kanakadurgamba, Addl. Director of Medical and Health Services, Andhra Pradesh, Hyderabad.
17. Shri P. K. Das, Public Analyst, Government of Assam, Shillong.
18. Dr M. N. Saran, Public Analyst, Public Health Institute, Bihar, Patna.
19. Dr T. J. Boman, Office Institute, State Public Health Laboratory, Baroda.
20. Dr J. C. Sharma, Assistant Director of Health Services (Public Health), Kennedy House, Simla-15, Himachal Pradesh.
21. Dr S. L. Khosla, Deputy Director of Health Services, Haryana, Chandigarh.
22. Director of Health Services, Jammu and Kashmir, Jammu/Srinagar.
23. Shri P. Janardana Aiyar, Chief Government Analyst, Govt. of Kerala, Trivandrum.
24. Dr L. K. Mishra, Deputy Director of Health Services, Madhya Pradesh, Bhopal.
25. Shri K. K. Rangnekar, Commissioner of Food and Drugs Administration, Maharashtra State, Griha Nirman Bhavan, Opposite Kala Nagar, Bandra (East), Bombay-61.
26. Shri C. P. Hartman, Sr. Chemist and Public Analyst, Government of Mysore, Anand Rao Circle, Bangalore-9.
27. Dr T. Sengupta, State Small Pox Officer, Dte. of Health Services, Nagaland, Kohima.
28. Shri M. N. Mohanty, Public Analyst to the Government of Orissa, State Public Health Laboratory, Bhubaneswar.
29. Dr Hargobind Singh, Public Analyst (Punjab), Food and Drug Test Laboratory, Sector-11, Chandigarh.
30. Dr R. R. Purohit, Additional Director, Medical and Health Services (Administration), Rajasthan, Jaipur.
31. Thiru K. Ramachandran, Government Analyst, King Institute, Guindy, Madras.
32. Director of Health Services, Tripura, Agartala.
33. Dr S. B. Singh, Public Analyst to the Government of Uttar Pradesh, Lucknow.
34. Dr N. Ganguli, Assistant Director of Health Services (P.F.A.), West Bengal, Mitra Building, Calcutta-1.

Utilisation of Release Orders

The following new condition shall be deemed to have been added in the form of release order as given in Appendix 34 of the Hand Book of Rules and Procedure, 1974-75.

'7. It is a condition of this release order that it shall be registered with the canalising agency concerned within 60 days from the date of its issue, in accordance with the conditions prescribed by the canalising agency concerned. Failure on the part of the release order holder to register the release order within the stipulated time will render the release order invalid for being serviced by the canalising agency'.

Release orders, including those registered with the canalising agencies concerned, within the period of sixty days as stipulated shall expire as soon as their validity period, which is normally 12 months. The canalising agencies shall not service the release orders which have expired. Requests for revalidation of release orders, upto a period of six months at a time, may be considered, on merits. In such cases the applicant should produce a letter, in original, from the canalising agency concerned that the goods covered by the particular Release Order could not be supplied within the original or extended validity period, on account of circumstances beyond the control of the applicant.

The relevant provisions of the Import Trade Control Hand Book of Rules and Procedure for 1974-75 and the Import Trade Control Red Book (Volume I) for the year 1974-75 may be deemed to have been amended accordingly.

(Public Notice No. 13 ITC (PN) 75 dated 14.2.1975, issued from file No. IPC (GE NL. 1)/STC)/74).

Export Houses

The following amendment is made in the Government of India, Ministry of

Commerce Resolution on 'Export Houses', published in Part I Section I of the Gazette of India Extraordinary dated the 30th March 1968.

For the existing para 7 of the Resolution, the following is substituted:

'7. Recognition may be withdrawn at any time, if Government are satisfied, after giving reasonable opportunity to show cause against the proposed action, that the Export House has failed to maintain export performance up to the prescribed level referred to in para 5 (e) or it has, on any occasion been a party to any corrupt or fraudulent practice in commercial dealings or it is found that it has used in support of its application for recognition any document which is false or fabricated or which has been tampered with or if it commits a breach of any law (including any rule, order or regulation) relating to Customs or the import and export of goods or foreign exchange or of the conditions of any licence, permit or order issued under or in relation to any of the aforementioned laws'.

(Resolution No. 19(75)/74-EAC, dated the 31st January 1975).

Finalisation of Drawback Claims

Further to the Calcutta Custom House Public Notice No. Customs—C3 dated 11-10-1974, it is notified for information and guidance of all concerned that with a view to speed up the finalisation of drawback claims the exporters may clearly specify the following on the Shipping Bill besides declaring all other particulars which are necessary for determining the amount of drawback payable:

- (a) Full description of the goods containing all the relevant materials.
- (b) The item number in the Drawback Schedule.
- (c) The exact rate claimed.
- (d) If brand rate is claimed, the reference number of the rate fixation letter

is to be mentioned; if there is no rate, it should be specified clearly when the application was made for brand rate and the reference number of Drawback Directorate's file in which the matter is under consideration.

- (e) No brand rate is to be applied for if an all industry rate is there. The party should claim the drawback admissible and if they feel they are eligible for special brand rate they may apply for the same and clearly specify this fact in Bill.

(Public Notice No. 18, issued from file No. S34G-76/72 D).

Payment Against Imports from Poland

The Trade and Payments Agreement concluded by the Government of India with the Polish People's Republic for the years 1975 to 1977 provides that export of goods and services from Poland shall be expressed in U.S. dollars. Payments will be effected in non-convertible Indian rupees. It is accordingly notified for the information of the importers that all contracts concluded under this Agreement and commercial and financial documents relating thereto for the imports of goods and service from the Polish People's Republic shall be expressed in U.S. dollars. For crediting the account of the Bank Handlowy, Warsaw, U.S. dollar will be converted into rupees at the dollar/rupee rate obtained on the basis of:

- (a) The previous working day's closing middle rate for the dollar in terms

of pound sterling in the London Market; and

- (b) The middle rate of the commercial bank maintaining the account of Bank Handlowy, Warsaw, for buying and selling pound sterling in terms of Indian rupees.

(Public Notice No. 14-ITC(PN)/75 dated 20th February 1975, issued from file No. IPC (Gen. 53)/Rupee/75).

Export of Gur and Khandasari Sugar

Attention of the trade is invited to the Export Trade Control Order No. E (C) O, 1968/AM(156) dated the 29th April 1975, reproduced in this office, Export Trade Notice No. 106/75 dated 6-5-1975 on the above subject.

2. It has been decided by the Ministry of Commerce that export of the following items will be banned with effect from the 29th April 1975:

1. Khandasari Sugar.
2. Gur (including Jaggery, Powder, etc.)
3. In this connection, it has been decided by the Ministry of Commerce that this ban will not however effect the contracts entered into, where irrevocable letters of credit were opened by foreign buyers and accepted by Indian banks prior to the date of imposition of the said ban. No export will be allowed against irrevocable letter of credit extended after the date of the imposition of the said ban. Other conditions as laid down in GLI No. 116/63 dated 4-10-63 will also be applicable here.

Men and Companies

- *Dr Anand G. Naik-Kurade*
 - *Shri H. N. L. Pandey*
 - *Shri M. R. Chandrasekhara*
 - *Dr Y. S. Lewis*
 - *Shri V. K. Rekhi*
 - *Shri Tapan Kumar Choudhuri*
 - *Shri P. N. Kapur*
 - *Shri Hanmantrao Ajit Kulkarny*
 - *Shri H. M. Bhavanagary*
 - *Depro Foods Limited, New Delhi*
 - *Federation of Biscuit Manufacturers of India*
-

Dr Anand G. Naik-Kurade



Dr Anand G. Naik-Kurade, Proprietor, Suman Food Consultants, 59, Hemkunt, New Delhi-110048, returned in January from his one and half month study tour of West Europe. During his tour, he visited different food factories as well as food machinery manufacturing industries in Italy, Switzerland, Austria, Germany, Netherlands, France, Sweden and U.K.

M/s Suman Food Consultants, in collaboration with Industrial Consulting Bureau Pvt. Ltd., New Delhi, have been appointed as Consultants by Himachal Pradesh Horticultural Produce Marketing and Processing Corporation Private Limited, Simla, on integrated processing of apples, a World Bank Project. Dr Naik-Kurade's tour abroad was in connection with this project.

He also visited FAO office in Rome and had discussions with Dr H. A. B. Parpia and others on the work of FAO in Food Industries in the developing countries of the world.

Shri H. N. L. Pandey



Shri Hari Nandan Lal Pandey, Deputy Director (Extension), Directorate of Horticulture and Fruit Preservation, U.P., is retiring on 1st August 1975, after serving the Directorate of Fruit Utilization, U.P., for over 32 years in research, training and extension services.

Born on August 1, 1917, in Farrukhabad Distt, Shri Pandey obtained B.Sc. (Ag.) Degree in 1943 from Government Agri-

culture College, Kanpur. He joined as Inspector, Fruit Utilization, in the Department of Agriculture, U.P. Shri Pandey did pioneering work for the popularisation of the home preservation of fruits and vegetables in Uttar Pradesh as an extension worker of the Tuitional Class and Community Canning Team.

Shri Pandey completed the Post-Graduate Advanced Diploma Course in Fruit Technology, Lyallpur, on deputation from U.P. Government.

In 1957, he was appointed Extension Service Officer in the Directorate. Shri Pandey is now looking after the work of 64 Government Community Canning Centres in U.P.

Shri Pandey has also written a book on Fruit Preservation.

Shri Pandey expects to continue actively after retirement by serving the public by his technical knowledge and experience in the Fruit Preservation Industries.

Shri M. R. Chandrasekhara



Shri M. R. Chandrasekhara accompanied by his wife attended the International Congress of Food Science and Technology at Madrid, Spain, during September 1974. The Congress was sponsored by the Interna-

tional Union Food Science and Technology of which the Association of Food Scientists and Technologists (India) is a member. The Congress was held in the Palace-de-Congress in Madrid. Before the Congress was inaugurated there was a one-day workshop organised by the League for International Food Education (LIFE), an organisation sponsored by the U.S. AID. Developing countries like Indonesia, Malaya, Ceylon, Philippines, Central America and African countries were represented. India was represented by Dr K. T. Achaya, Executive Director, Protein Foods and Nutrition Development Association of India, Bombay and Shri M. R. Chandrasekhara. The object of the workshop was to bring about a dialogue regarding the aid from developed countries for fostering food industries in developing countries.

A number of papers were presented at the International Congress of Food Science and Technology. The topics discussed ranged from protein isolates, flavours, gums and other food additives. The papers presented on isolation of protein from peanut, coconut and rape seed were of considerable interest. Shri M. R. Chandrasekhara presented a paper on the Nutrition Programmes in India with special reference to Balahar and Miltone. There was a round-table conference on the transfer of technical aid to developing countries. Dr H. A. B. Parpia gave a review of the need and objectives for transfer of technology. Dr Achaya spoke on the possible areas of technical help in the field of education and the problems of research institutions in India.

In London, Shri M. R. Chandrasekhara visited three research centres. The British Food Manufacturing Industries Research Association at Leatherhead is entirely financed by the industry and it provides information to the members regarding standardisation, analysis or any other aspect of the

oods they are manufacturing. Dr A. W. Holmes is the Director of the Institute. The Tropical Products Institute is Government sponsored. It undertakes research in tropical products. Aflatoxin in groundnuts and its characterisation was discovered here. FAO project on the composite flours for bread making is in operation in this laboratory. They have finalised a project for extraction of protein from coconut. Shri Chandrasekhara addressed the Research workers on the work at CFTRI, Mysore. Dr Carpenter, Professor at the Cambridge Agricultural College took them round the University and showed its historical nature. Shri M. R. Chandrasekhara addressed the meeting of the Scientists on the Social Welfare Projects in India.

From London Shri Chandrasekhara and wife went to Wageningen in Netherlands, a small town on the banks of Rhine. This village is surrounded by research institutes. The Agricultural University and the Institute for Processing and Storage of Agricultural Produce, Department of Food Science and Technology, and Institute of Cereals are situated here.

Shri Chandrasekhara was interested in one project which the IBVL (Institute voor Bewaring en Verwerking van Landbouwprodukten) has undertaken on the extraction of protein from *Vicia faba* (broad bean). The second project is the utilization of potato waste for starch and protein recovery. Micro-organisms are being used to enhance the protein content in the potato waste for feeding animals. The Institute of Cereals is also participating in the FAO Project on the use of composite flours. The Nestle Research Laboratories are situated in a village, at Orbe near Geneva. The laboratory is exceedingly well equipped. They have basic food technology division, physics, chemistry and mathematics divisions, engineering division, food chemistry division and a division for operation research. In the basic divisions they are working on

protein foods and flavour stimulants. The Director, Prof. Mauron, a very well known biochemist, had under his direct control the biology service division. One of the projects they have undertaken is to find the effect of stimulants on the behaviour on rats. He met Dr Buffa who is the head of the Food Conservation section of UNICEF. He is in-charge of projects for production of protein foods in Algeria, Turkey and Morocco. The types of food they are producing are similar to Balahar. Respective Governments have taken great interest in establishing units for the production of these.

They spent a few days at Rome and visited the Food and Agriculture Organization and had discussions with the officers connected with the problems of production of weaning foods and other protein foods. The Teheran Government has a programme by which wheat is distributed to units under subsidy. The units are asked to make 'Nan' from the wheat and this is sold under subsidised rates. Sale of wheat products other than 'Nan' is prohibited. It appears to be a very good method of providing the staple food to the population at a subsidised cost.

Dr Y. S. Lewis

Dr Y. S. Lewis has been upgraded to Scientist E in the Discipline of Plantation Products and Flavour Technology, Central Food Technological Research Institute, Mysore.

Born in Kolar, Karnataka State, on 23rd February 1921, Dr Lewis had his initial education at Bangalore. In 1940, he did B.Sc. degree of Mysore University and in 1945, M.Sc. in Chemistry from the Banares Hindu University.

Dr Lewis worked as Industrial Probationer in the Mysore Government Soap Factory during 1947-1948.

Dr Lewis went abroad in 1948 as Dalal Scheme Scholar to specialise in Fermentation Technology. He took M.S. in



Bacteriology in 1950 from the Illinois Institute of Technology, U.S.A. He worked as Assistant Professor of Biochemistry at the Medical College, Mysore, during 1950-52. Joined the Central Food Technological Research Institute in 1952 as Scientific Officer. He was awarded Ph.D. in 1970 for his thesis on Chemistry of Plantation Products. At present, he is working as Scientist in the Discipline of Plantation Products and Flavour Technology, CFTRI.

Dr Lewis has published about 60 papers on fermentations, spice oils and oleoresins, flower and herb oils. Processes developed on bakers' yeast, tamarind concentrate, cardamom oil and spice oleoresins have been taken over by industry. He is a Member of the Editorial Board of the Indian Food Packer.

Shri V. K. Rekhi

Shri V. K. Rekhi is the Brand Manager, Dipy's canned and bottled food products, manufactured by Herbertsons Limited, Bombay.

Born in 1945, he graduated in Economics Honours from the Delhi University and



did Masters in Business Administration from the Indian Institute of Management, Ahmedabad, in 1967. He had a very successful academic career at Ahmedabad where he was awarded a scholarship.

Shri Rekhi joined Polsons in 1968 as an Assistant Marketing Executive and at the time of joining Herbertsons, he was the Sales Manager, Polsons' Limited, Bombay.

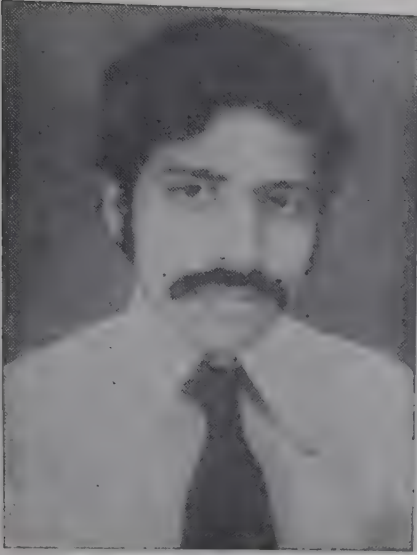
He is a Member of Bombay's Amateur Riders' Club. Shri Rekhi has also taught Marketing Manager Course at the Poddar College, Bombay, for two years.

Shri Tapan Kumar Choudhuri

Shri T. K. Choudhuri is Research Assistant, Metal Box Company of India, at their Research Department, Alipore, Calcutta.

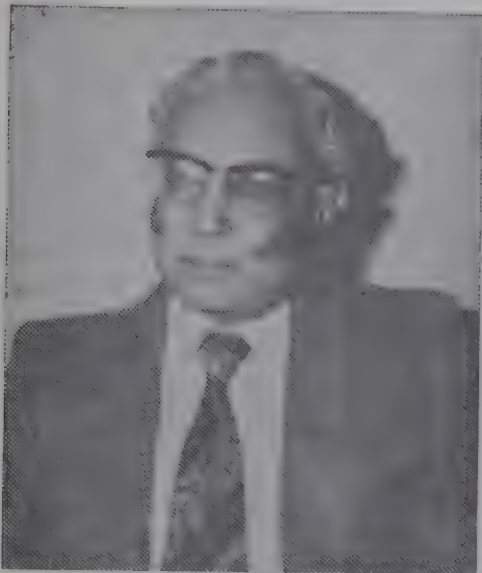
Born on 1st February 1949, he completed B.Sc. (Hons) from the Burdwan University in 1969 and B. Tech. in Food Technology and Bio-Chemical Engineering of Jadav-pore University in 1973.

Shri Choudhuri has worked in Fermentation Technology as applied in Breweries and Distilleries towards production, quality



control and distillation. He has also carried out a project on production and blending of alcohol.

Shri P. N. Kapur



Shri Pran Nath Kapur has taken over as Director-General, Indian Institute of Foreign Trade, from January, 1975.

Aged 53, Shri Kapur has completed M.A., LL.B. He has also successfully completed a course on comparative local government at Hague, Netherlands.

Shri Kapur served as Civilian officer in Armed Forces between 1943 and 1947. He was Secretary to the Government of Uttar

Pradesh in the Departments of Civil Supplies, Food, Revenue, local self government and Controller, Muir Mills Company Limited, Kanpur, in 1966. He was Commissioner, Meerut, during 1970-72 and Textile Commissioner, Government of India, Ministry of Commerce from September, 1973 till he took over the present assignment as Director-General, Indian Institute of Foreign Trade, New Delhi.

Shri Hanmantrao Ajit Kulkarny



Shri Hanmantrao Ajit Kulkarny, born on 1st September 1949, is the son of Dr H. L. Kulkarny, Vice-Chairman, Karnataka Agro Industries Corporation Limited, Bangalore.

After his B.Com. from the B.M.C.C., Poona University, in the year 1972, Ajit completed M.B.A. with specialisation in Marketing in 1st Class from the Commerce College, Kolhapur. He has also done two years Diploma in German language conducted by the Poona University.

For acquiring practical experience he underwent management training at Remco, Bangalore; Kirloskar Electric Company Limited, and S. V. Rangaswamy and Company Limited, Bangalore. Ajit formed the Rotract Club of Kolhapur and was its founder President in 1972. He has captained

the Cricket Team of St. Joseph's Bangalore, during his school days.

Shri H. M. Bhavanagary



Shri H. M. Bhavanagary has been appointed Scientist 'C' from 22nd April 1975 at the Central Food Technological Research Institute, Mysore, in the Discipline of Infestation Control and Pesticides.

Born on 3rd March 1930 at Bhavanagar in Gujarat State, he received his B.Sc. degree in Chemistry with first class honours in 1954 from Karnatak University, Dharwar. He was awarded the Associateship by the Institution of Chemists (India) in 1960.

Shri Bhavanagary commenced his professional career as Scientist at Central Salt and Marine Chemicals Research Institute, Bhavnagar, in 1965. Here he has worked extensively on the winning of potassium and magnesium chemicals from the waste liquors known as Sea Water Bittern of solar salt industry. He has developed processes for the separation of potassium salts such as potassium chloride and potassium sulphate and has worked on the recovery of potash from molasses distillery and spent wash liquor using ion-exchange technique. He has

published along with his associates 17 research papers and has taken a patent on the subject of potash separation.

After joining Central Food Technological Research Institute, Mysore, in 1967, he has worked on the manufacture of insecticides and pesticides. He has developed patented processes for the manufacture of methyl bromide which is employed as a fumigant for the control of stored grain pests. He has also worked on the preparation of low bulk density aluminium silicate used as an insecticide and as a carrier for pesticides for spraying over agricultural crops for the control of field pests. On this subject he has 7 research publications in Indian and foreign journals and has taken 2 patents.

He has carried out fundamental studies on the neutralization of acidic radical of dicalcium phosphate to obtain tricalcium phosphate of the desired purity for its use as a non-toxic grain protectant.

Depro Foods Limited, New Delhi

Depro Foods Limited have shown improvement in its working during 1974. The directors are hopeful of better performance during the current year because of orders on hand and the performance in the first five months of 1975.

Sales during 1974 were Rs 55.19 lakhs against Rs 18.65 lakhs in the previous period of 18 months. Net profit during the year was Rs 9,321 against a net loss of Rs 7.44 lakhs in the previous period of 18 months, after providing Rs 1.18 lakhs for depreciation and Rs 16,318 for development rebate reserve.

During 1974, the company introduced bottled fruit nectars and they were well received by the public. The total sales during the first five months of 1975 were Rs 25 lakhs; the directors hope to achieve sales target of Rs 80 lakhs for 1975.

The company has on hand orders worth Rs 20.53 lakhs, which include orders for exports worth Rs 5.75 lakhs. The company would provide Rs 2.30 lakhs for development rebate reserve for the year ended June 30, 1972 and Rs 51,518 for development rebate for the 18 months' period ended December 31, 1973. The balance sheet as on December 31, 1974 shows net carried forward loss of Rs 17.31 lakhs against its paid up capital of Rs 19.50 lakhs after providing arrears of depreciation of Rs 2.61 lakhs and adjusting the profit.

Federation of Biscuit Manufacturers of India

The Twenty-fifth Annual General Meeting of the Federation was held at the pre-

misses of the Federation, Alipur Road, Delhi on Saturday, 22nd March 1975.

Shri N. K. Roy delivered the presidential address. He observed a 9 per cent decline in production from 1973. The production was 56,235 tonnes as compared to 61,750 tonnes during the previous year. This is due to shortage of basic raw materials. Compared to 1973, the price of wheat flour rose by 84 per cent, hydrogenated oil by 39 per cent, sugar by 27 per cent, protective paper between 26 to 41 per cent, cans by 42 per cent, tinplate by 29 per cent and aluminium foil by 50 per cent. Added to this high price of raw materials, there was shortage in power and fuel.

The export trade showed a satisfactory progress. There was an increase of 43 per cent in quantity and 85 per cent in value.

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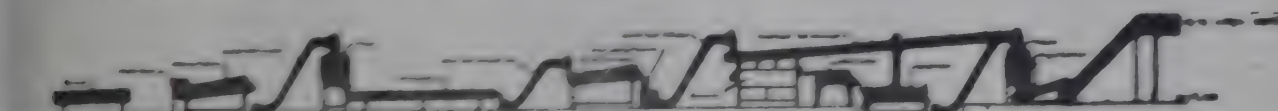
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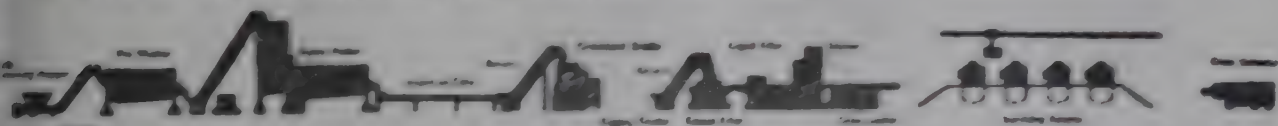
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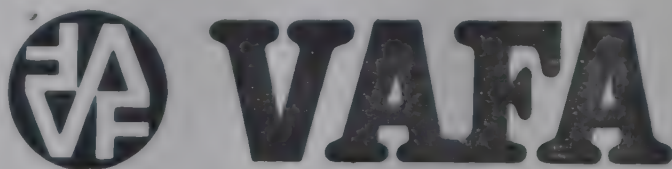
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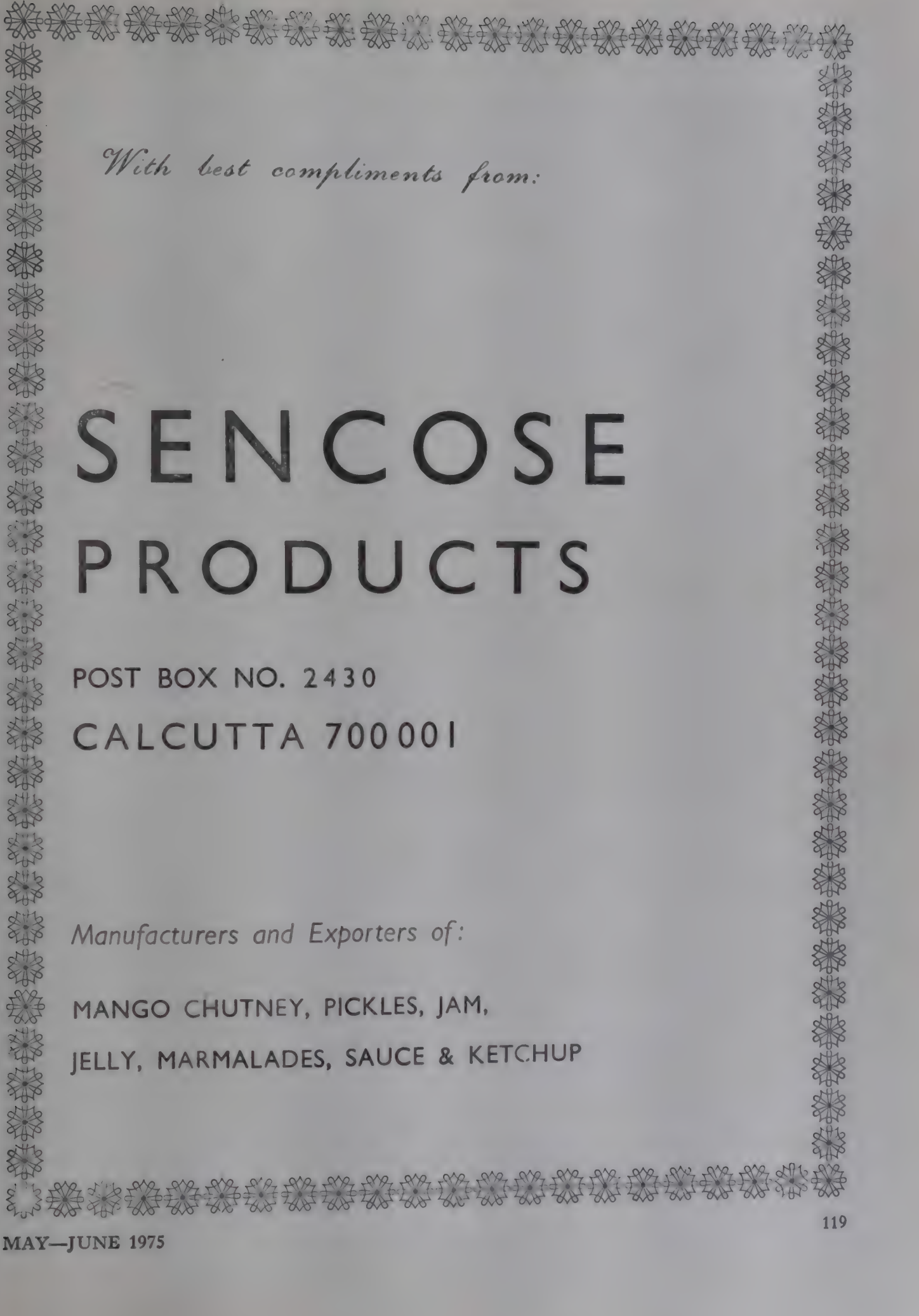
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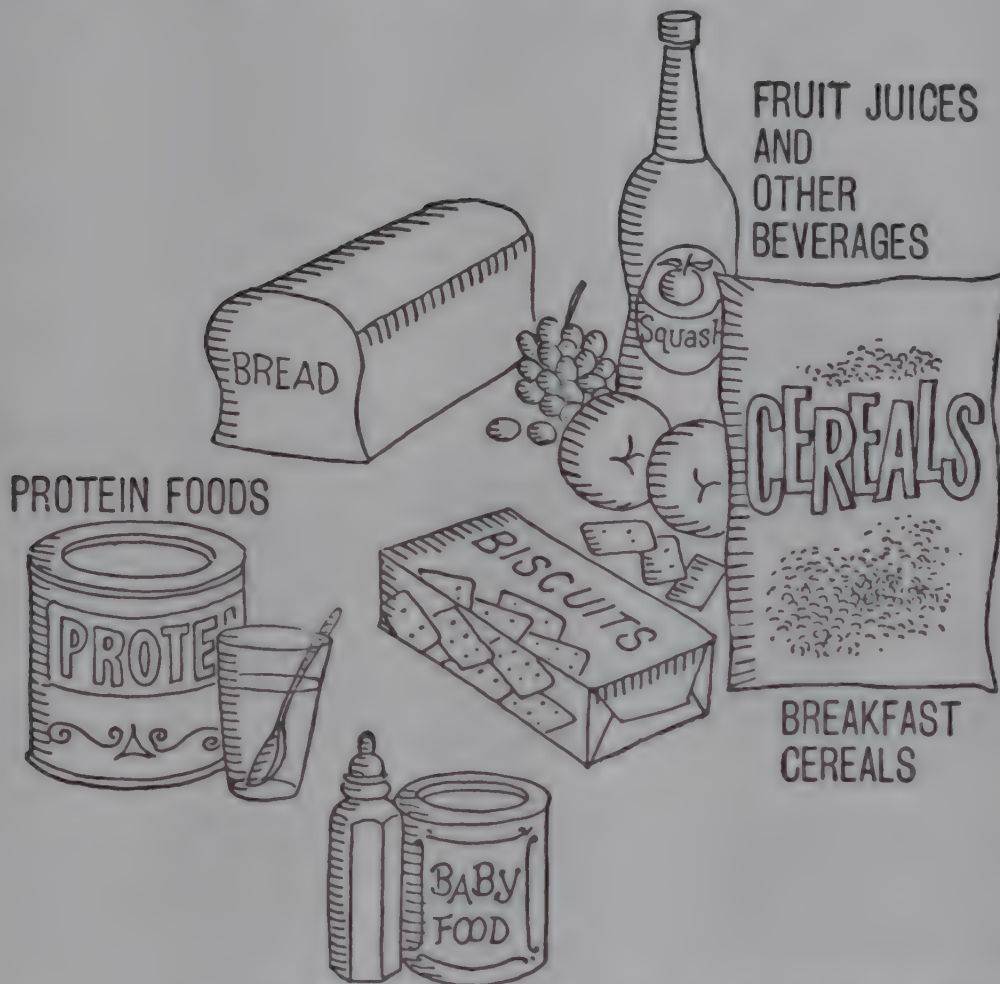
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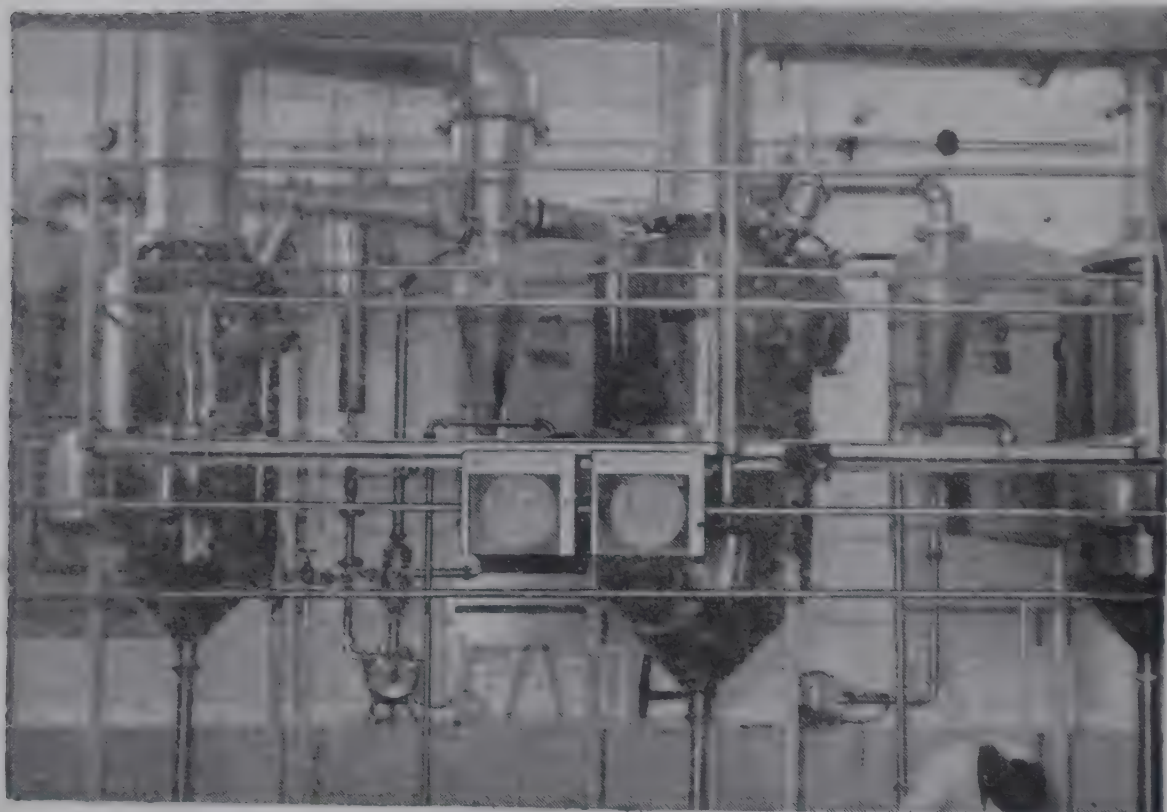
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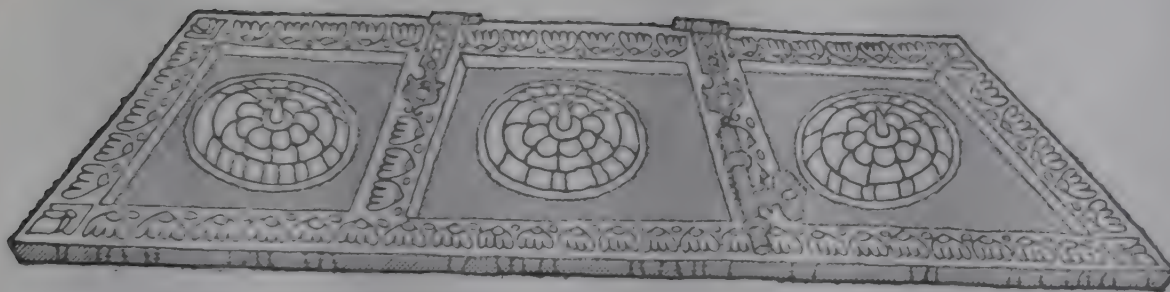
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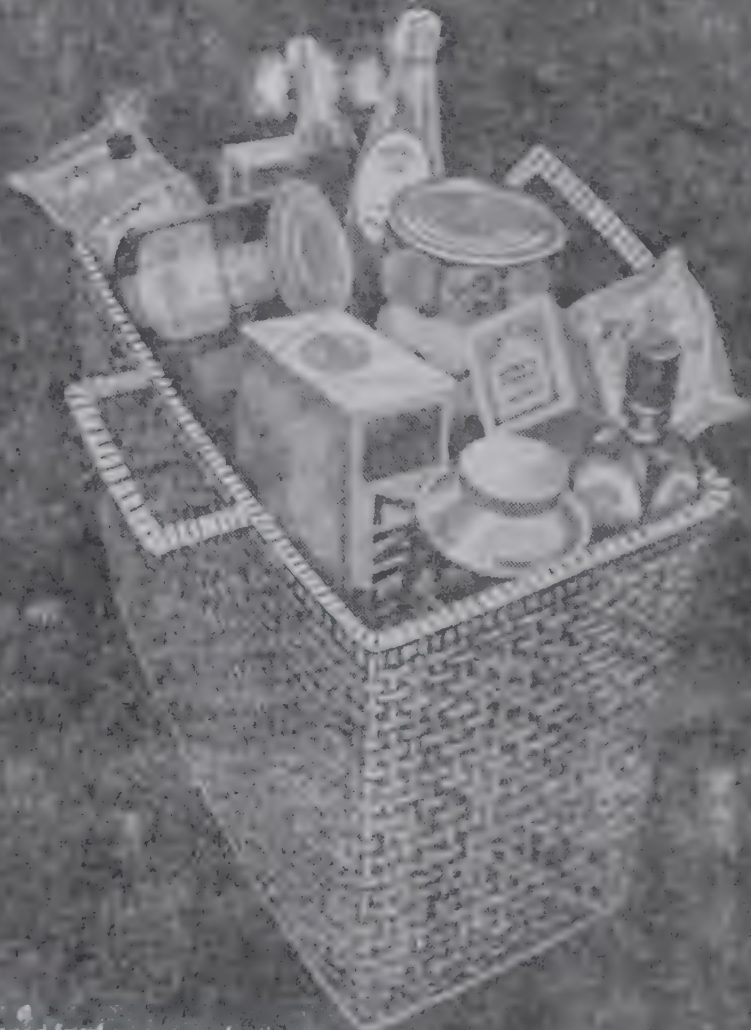
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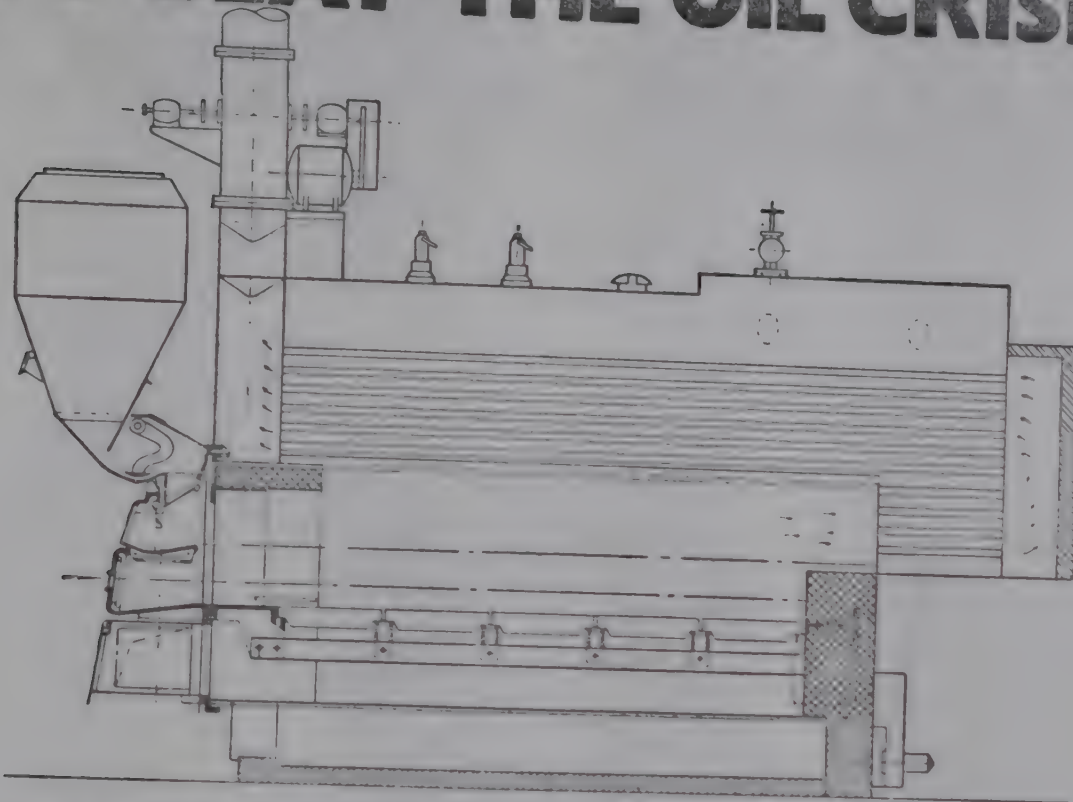
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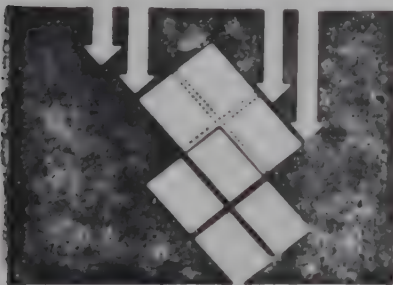
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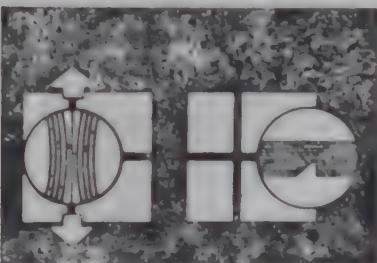
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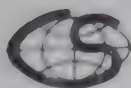
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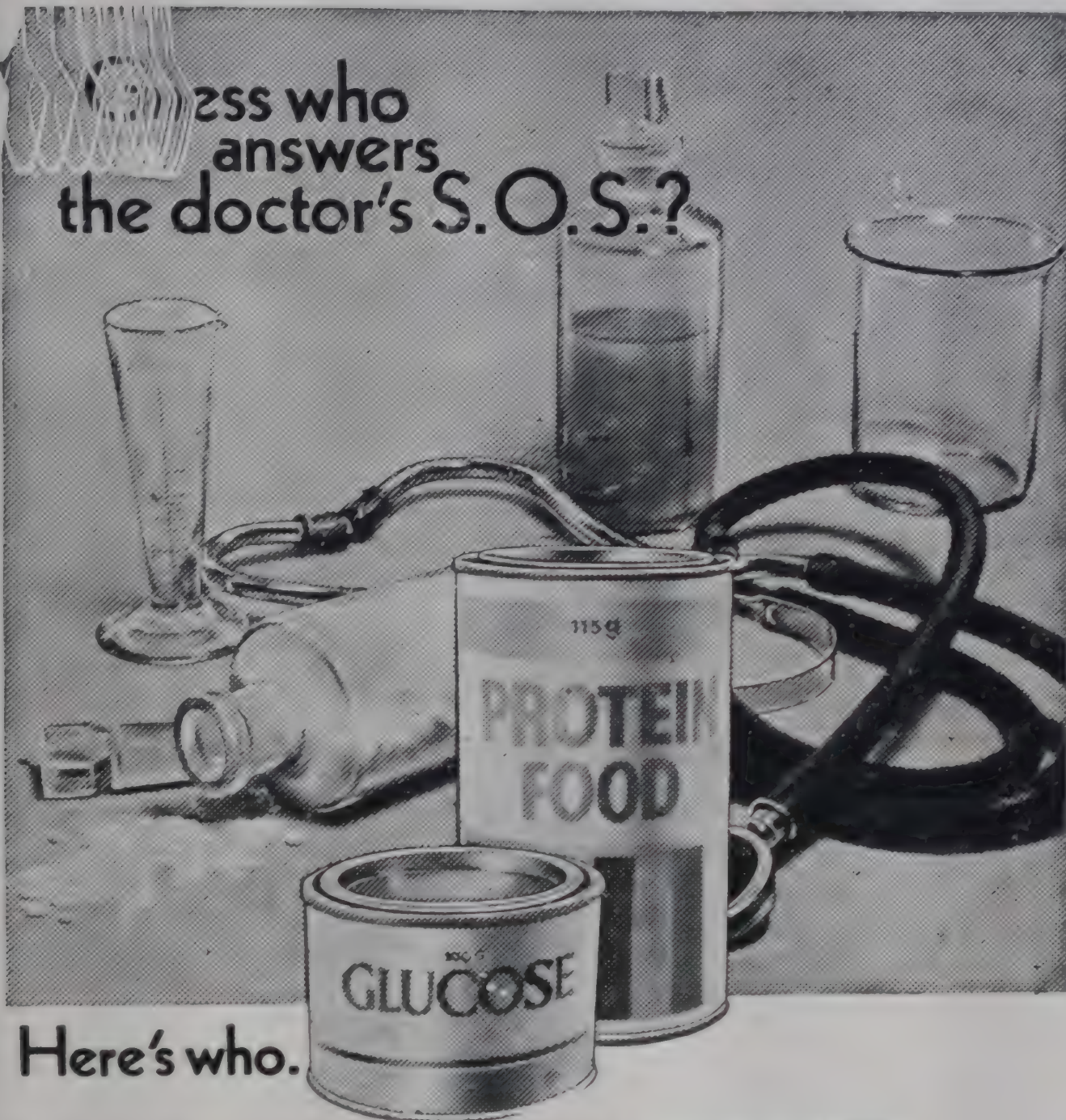
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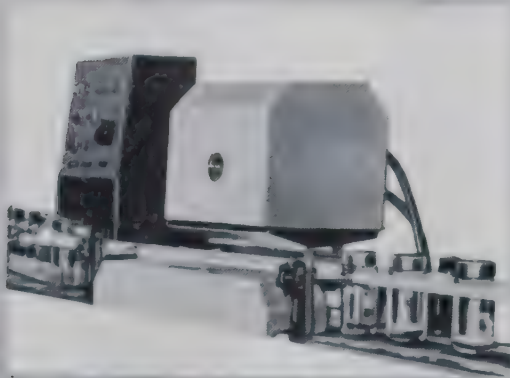
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Editorial

The Ministry of Industry and Civil Supplies, Government of India, has issued order S. O. No. 443 (E) dated 22nd August 1975 in supersession of earlier order of 28th July 1975 under the Defence and Internal Security Rules, 1971, called 'Defence of India, Packaged Commodities Order 1975'. The order comes into effect on 2nd October 1975. The products manufactured before the appointed date are permitted to be sold upto 1st January 1976. Thereafter, the packages must contain information to the effect that the product is manufactured prior to 2nd October 1975. The packages must give details as to the identification of the product, net contents, month and year of manufacture, name and address of the producer and the maximum price excluding local taxes which the retailer will charge at the time of sale to the customer. Bulk packages meant for export and edible oils above 15 kg packaging are exemption from this provision. Fixation of retailers margin has been left to the discretion of the manufacturers which means it will not be uniform in all the markets. It will be helpful if the Packaged Commodity Order could give guidelines for the fixation of retailers margin for different product groups.

The Department of Health, Ministry of Health and Family Planning, Government of India, has invited public comments,

objections or suggestions for inserting Rule 32 (bb) in the PFA asking the manufacturers and packers to declare, on the labels, the date of expiry of the products. At present there is no expiry period clause in the Fruit Products Order (FPO) and Prevention of Food Adulteration (PFA) Act. Coded information as to the name of the product, date, month and year of manufacture are embossed on the containers/labels conforming to the FPO and PFA. The time is not ripe for the industry to mention the date of expiry on the packages of processed fruits and vegetables. Due to the inflationary trends prevailing all over the world and also in the country the consumer prices have gone up substantially during 1973 and 1974 and the movement of the packaged products from retailers' shelves has slowed down considerably. There is a sharp downward trend in the sales curves during 1975 and any move to restrict the shelf-life will further hamper growth and development. The industry will welcome that the FPO should take up the project to establish the necessity for declaring the date of expiry and also fix the shelf-life of different products in consultation with the industry, Research and Development. There should be a co-ordination between the Packaged Commodities Order, Department of Food in the Ministry of Agriculture (FPO) and the Department of

Health in the Ministry of Health and Family Planning (PFA) and further amendments be issued under the concurrence of above mentioned departments.

Another gesture from the Government which the industry will welcome, with great relief, is the scrapping off of local taxes like municipal corporation taxes and town duty. This is the greatest handicap for quick transportation and movement of

goods, and has been the cause of unnecessary increase in the cost of overheads and in some cases harassment. The Government should evolve an alternative method so that the revenues of the corporation municipalities do not suffer and dispense with the present primitive method of octroi collection. This will go a long way in curtailing red-tapism and speed up movement of goods.

VARIETAL VARIATIONS IN THE PHYSICAL CHARACTERISTICS AND CHEMICAL CONSTITUENTS OF THE FRUITS OF TOMATO (*LYCOPERSICON ESCULENTUM* MILL)

MRS GURDEEP KAUR,* J. S. KANWAR† AND MISS URMIL BINDRA‡

Tomato is well known for its nutritive value among vegetable crops. It is a rich source of ascorbic acid, and in fact, ranks third in vitamin C content. Besides being a rich source of ascorbic acid and carotenoid pigments, it contains other constituents which render it one of the most liked item in the diet. Tomato is often used in the manufacture of many processed products like juice, sauce, ketchup, canned tomatoes etc.

Being an important fruit in the daily diet and in accordance with the liking of the people for its particular shape, size, colour, texture and taste, a large number of varieties are grown throughout the country. The chemical composition in tomatoes varies with the variety, soil and climatic conditions in which they are grown. A large number of workers have reported the chemical composition and factors governing the quality of tomato^{5,6,7,17,18,19,22}. There is meagre information available about the mineral constituents of tomatoes. In this paper, the data in respect of dry matter, vitamin C, acidity, reducing sugars, crude protein, calcium, iron, copper, phosphorus, zinc and manganese contents of twelve varieties of tomato alongwith its physical characteristics has been reported.

Materials and Methods

The crop was transplanted in randomised block design with three replications at vegetable farm, Punjab Agricultural University, Ludhiana. The crop was raised using recommended doses of fertilizers and taking constant care of irrigation, climatic conditions and insect pest control. Uniformly matured fruits of similar stage of maturity were picked. Equal number of fruits from all the replications under each variety were pooled and composite samples from the whole fruit crushed were analysed in duplicate. For the determination of vitamin C and acidity the tomato juice was taken.

The oven dry weight was based on samples dried at $65 \pm 2^\circ\text{C}$ to a constant weight. Ascorbic acid was determined in the fresh samples by 2, 6 dichlorophenol method according to A.O.A.C.¹ and Bhatia *et al*⁴. The titrable acidity was determined by titrating 5ml of juice against 0.1 N sodium hydroxide solution using phenolphthalein as an indicator and was expressed in terms of per cent anhydrous citric acid. Sugars were extracted exhaustively with hot water and estimated according to method of Hulme and Narain (1931)⁹. Crude protein was determined after an estimation of the total nitrogen by Micro-Kjeldahl method

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(Bhatia *et al.*)⁴ and multiplying it by 6.25. Minerals were extracted from the oven dried ground material by wet digestion with nitric acid and perchloric acid (4:1). Phosphorus in the extract was determined colorimetrically according to the vanado-molybdo-phosphoric yellow method and calcium by versene titration method (Jackson, 1958).¹¹ Iron, zinc, copper and manganese were determined with the help of atomic absorption spectrophotometer. The results are expressed on fresh weight basis.

Results and Discussion

Characteristics

From the Table 1, it appears that mainly the varieties were of two shapes i.e. round and pear shape and according to consumer acceptance, variety *Punjab Tropic* is the best as it is round, has large fruit size and

deep red colour followed by *Keckruth*, *S-12* and *Pusa Early Dwarf* in descending order. *Punjab Tropic* is also best for juice extraction as it is a juicy variety.

Chemical composition

The vitamin C and acidity were reported on tomato juice basis and others on whole fruit basis (Table 2).

The dry matter content varied from 4.95 to 7.48 per cent. This was in accordance with reported values by McCollum (1944 and 1946),^{12,13} Thompson (1961)²¹, Winsor *et al.* (1962)²² and Bajwa *et al.* (1969)⁵. The vitamin C content ranged from 12.17 to 26.38 mg/100 ml of juice. Bajwa *et al.*⁵ have reported the range of ascorbic acid as 24.6 to 35.1 mg/100 g. They analysed only four varieties. McCollum (1944, 1946 and 1956)^{12,13,14}, Frayer *et al.* (1954)⁸, Reynard and Kanapaux (1942)¹⁶, Winsor *et al.* (1962)²², Nanjunda-

TABLE 1. Physical characteristics of different varieties of tomato

Sl. No.	Variety	Shape	Size	Colour on ripening	Presence/Absence of green shoulder	Firmness
1.	<i>S-12</i>	Round	Medium	Red	Absent	Normal
2.	<i>Pusa Ruby</i>	Round (Not uniform)	Medium	Red	Absent	Normal
3.	<i>Angus Lata</i>	Oblong	Small	Red	Present	Soft
4.	<i>EC-55055</i>	Pear	Medium	Red	Absent	Very poor
5.	<i>Tomato-I</i>	Oblong	Medium	Red	Absent	Slightly soft
6.	<i>Punjab Tropic</i>	Round	Large	Deep Red	Present but disappear on ripening	Firm
7.	<i>EC-55054</i>	Pear	Medium	Red	Absent	Firm
8.	<i>K. Kuber</i>	Round	Small to Medium	Red	Present	Normal
9.	<i>S-120</i>	Round	Medium	Red	Absent	Normal
10.	<i>Keckruth</i>	Round	Medium to Large	Red	Present	Normal
11.	<i>Keckruth-Ageti</i>	Round	Medium	Red	Present	Normal
12.	<i>Pusa Early Dwarf</i>	Round	Medium	Red	Absent	Normal

TABLE 2. Some chemical constituents of various varieties of tomatoes
(values are the average of duplicate estimation expressed on the fresh weight basis)

Sl. No.	Variety	Dry matter %	Vitamin C mg/100 ml of juice	Acidity g. o anhydrous citric acid/100 ml Juice	Free reducing sugars %	Crude protein %	Calcium mg/100 g	Iron mg/100g	Copper mg/100 g	Phosphorus mg/100 g	Zinc mg/100 g	Manganese mg/100 g
1.	<i>S-12</i>	6.62	22.58	0.48	3.19	1.13	11.81	0.66	0.07	19.53	0.22	0.10
2.	<i>Pusa Ruby</i>	7.18	22.75	0.62	3.50	1.00	14.10	0.59	0.08	22.85	0.14	0.09
3.	<i>Angur Lata</i>	7.29	23.77	0.28	3.58	1.38	9.94	0.79	0.08	22.60	0.25	0.14
4.	<i>EC-55055</i>	6.09	21.80	0.38	3.09	0.78	11.10	0.46	0.08	23.75	0.18	0.12
5.	<i>Tomato-1</i>	6.44	26.38	0.57	3.89	0.91	9.17	0.50	0.08	22.86	0.21	0.11
6.	<i>Punjab Tropic</i>	6.66	21.59	0.45	3.88	0.94	8.67	0.45	0.07	19.98	0.19	0.09
7.	<i>K. Kuber</i>	4.95	12.90	0.38	3.95	0.93	8.84	0.54	0.06	14.35	0.17	0.09
8.	<i>EC-55054</i>	6.30	26.09	0.40	3.29	1.19	11.99	0.45	0.07	18.58	0.17	0.08
9.	<i>S-120</i>	5.35	12.17	0.36	3.72	0.80	8.25	0.51	0.07	18.19	0.12	0.09
10.	<i>Keckruth-Ageti</i>	7.48	20.86	0.43	4.17	1.20	14.85	0.75	0.08	25.81	0.08	0.12
11.	<i>Keckruth</i>	6.86	21.45	0.39	4.44	1.00	11.97	0.57	0.07	27.10	0.07	0.09
12.	<i>Pusa Early Dwarf</i>	6.56	19.86	0.28	3.14	1.37	12.88	0.66	0.09	28.86	0.23	0.08

swamy *et al.* (1963)¹⁵, Schultz and Kelley (1952)²⁰, and Clutter and Miller (1961)⁶ have determined the ascorbic acid in tomatoes under different physiological conditions. Reynard and Kanapaux (1942)¹⁸ studied 28 varieties of tomatoes and reported the ascorbic acid content as 4 mg to 24 mg per 100 g of fresh fruit whereas Frayer *et al.* (1954)⁸ observed much higher averages ranging from 22.20 to 36.28 mg and McCollum (1946)¹² as high as 47.6 mg/100 g of fresh fruit. Singh *et al.* (1969)¹⁹, when analysed some varieties of tomatoes, observed that their range of vitamin C was from 19.56 to 27.16 mg/100 g of the sample. According to Aykroyd,³ the edible portion contains 27 mg of ascorbic acid per 100 g.

Acidity of the juice varied from 0.28 to 0.62 g/100 ml. This is in close range of averages reported by McCollum (1956)¹⁴,

Winsor *et al.* (1962)²², Thompson (1961)²¹, Bradley (1964)³ and Bajwa *et al.* (1969)⁵.

The samples when analysed for free reducing sugars showed that the variation in per cent for reducing sugars was from 3.14 to 4.44. The variety *Keckruth* contained the maximum per cent of reducing sugars. Bajwa *et al.* (1969)⁵ found this range from 2.37 to 4.50 per cent. McCollum (1944, 1946 and 1956),^{12,13,14} Winsor *et al.* (1962)²² and Thompson (1961)²¹ have studied extensively the reducing sugars in tomatoes under different physiological conditions. Sometimes the lower limit for reducing sugars was observed as 2.5 per cent in tomatoes, with an upper limit around 4 per cent.

The crude protein per cent varied from 0.78 (*EC 55055*) to 1.38 (*Angur Lata*). This is in accordance with the findings of Bajwa *et al.* (1969)⁵. The concentration of calcium

ranged from 8.25 to 14.85 mg/100 g. The value for calcium reported by Aykroyd² is somewhat higher. This may be attributed to the variations in fertility conditions under which the crop was raised and the nature of the varieties (Jayadeviah *et al.*)¹⁰. Amongst various varieties *Pusa Early Dwarf* (28.86) was richest in phosphorus and *K. Kuber* (14.35) the lowest. The range of variability for iron content was from 0.45 to 0.79 mg/100 g. Zinc content ranged from 0.07 to 0.25, Mn content from 0.08 to 0.14 and copper from 0.06 to 0.09 mg/100 g. It may be observed that although there is considerable variation in respect of zinc content of the fruits, there is little difference in respect of manganese and copper content.

Summary

Twelve varieties of tomato were evaluated for their physico-chemical characteristics of their fruits. The range of variation for dry matter was 4.95 to 7.48, for acidity 0.28 to 0.62, for free reducing sugars 3.09 to 4.44, for crude protein 0.80 to 1.38 g/100 g and for vitamin C from 12.17 to 26.38, for calcium 8.25 to 14.85, for iron 0.45 to 0.79, for phosphorus 14.35 to 28.86 mg/100 g. There was not much variability in respect of copper and manganese.

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EFFECT OF PROCESSING AND STORAGE CONDITIONS ON THE STABILITY OF CHLOROPHYLL AND β -CAROTENE CONTENT OF GREEN LEAFY VEGETABLES AVAILABLE IN NORTHERN INDIA

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Summary

The present investigation was carried out to develop some new products based on green leafy vegetables grown in the Punjab, e.g. mustard greens, spinach, mint and coriander leaves. Green leafy vegetables namely mustard greens (*Brassica campestris* var. *Sarson*) and spinach (*Spinacia oleracea*) can be successfully utilized in the form of canned 'Sarson-Ka-Sag', frozen puree and strained puree. The process for the canning of mustard greens puree (Sarson-Ka-Sag) has been standardised. Blanching of leaves in two per cent sodium carbonate solution at 175°F for five minutes helped in retaining the green colour of the processed product. Organoleptic evaluation has shown that the consumer's acceptance of canned 'Sarson-Ka-Sag' puree and strained puree or strained baby food is very favourable and is quite promising. The product like canned 'Sarson-Ka-Sag' could stand very well for 5 months without impairment of quality. The yield of the finished strained puree of spinach and mustard greens was 60 and 53 per cent respectively. The puree had a smooth texture. Strained spinach puree is being used as a high quality baby food or as a base for other products (e.g., creamed spinach) whereas mustard greens puree showed a bitter after taste and required a longer cooking (30 minutes) to overcome the raw taste. Experiments showed that mustard green puree could be successfully blended with other strained puree, e.g. spinach puree to make the product more acceptable.

Introduction

Green leafy vegetables like mustard greens and spinach are a highly common farm produce in the Punjab and neighbouring states of Northern India like Jammu and Kashmir, Haryana, Himachal Pradesh, Uttar Pradesh, Rajasthan, Madhya Pradesh, and also in Tamil Nadu, Maharashtra, Andhra Pradesh and Karnataka but the utilization of the same has not been recognized on a commercial scale. In recent years, there has been an increasing emphasis on the use of green leafy vegetables for improv-

ing the dietary standards of the people. In India, green leafy vegetables have received a considerable attention by the nutritionists as a simple and economical means of providing vitamins and minerals to the people. The important leafy vegetables in India are mustard greens (*Brassica campestris*), spinach (*Spinacia oleracea*), coriander leaves (*Coriandrum sativum*) and mint (*Mentha spicata*).

Mustard greens are normally planted separately as a leafy vegetable under irrigated conditions around big towns. It is

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also sown separately for seed as well as for use as vegetable by the village people. In the early stages of plant growth, tender leaves along with the soft stems are plucked, sorted, washed, cut and cooked to a soft consistency along with other savouries. The cultivation of mustard greens is unfortunately confined to winter months whereas spinach, mainly grown in plains, is also available in summer in a limited quantity from the hills. It is, therefore, necessary to make every possible effort to make them available in fresh or processed form for human consumption throughout the year. It has been found that green leafy vegetables can be successfully stored in various processed forms such as puree, strained puree, frozen and canned stewed vegetables (Sarson-Ka-Sag) and treated in a score of ways and consumed later on. Hence the ultimate hope of feeding a larger population on a limited yield lies in the study of such types of feed storage and preservation. Preservation of seasonal vegetables meet the need for civilian use, defence forces and for foreign exchange earning.

In India, canned leafy vegetables like cabbage and spinach are mostly manufactured for the defence forces, whereas the demand from the civilian population is negligible. Much work has not been reported on this subject in India. However, in U.S.A. and continental countries, considerable work has been done on canning and freezing of spinach, but no information is available in India on the canning of 'Sarson-Ka-Sag' and its effect on stability of chlorophyll and β -carotene. It was, therefore, felt worthwhile to carry out these investigations. This part of paper will deal with mustard greens and spinach only.

Materials and Methods

Fresh mustard greens and spinach leaves were procured from the market and as well

as from the vegetable farm, PAU, Ludhiana. The fresh leaves were sorted, cleaned, trimmed, washed four times in cold water and then chopped. The following products were prepared based on the procedures reported by Lock Arthur¹, with some modifications:

- (1) Frozen mustard and spinach puree.
- (2) Frozen mustard and spinach strained puree.
- (3) Canned 'Sarson-Ka-Sag'

1. Mustard and Spinach puree

(a) Raw materials

During selection, only fresh leaves were chosen and special attention was given to:

- (i) Freshness (wilted leaves were rejected),
- (ii) Intensity of green colour (subjective), and
- (iii) Freedom from blemishes, mold, diseases and insect damaged portions.

(b) Cleaning and trimming

Leaves, obtained in bulk, contained stalks, wilted leaves, dirt, sand as well as mold contamination. Stalks were removed and the fresh green leaves were washed four times in a tank with cold water.

(c) Blanching

One kg lots of each of the cleaned and trimmed leaves were taken in a piece of muslin cloth and dipped in a solution of 2 per cent sodium carbonate (Stevenson and Swartz)² at 175°F for five minutes, chilled in cold water and drained for ten minutes in aluminium perforated trays immediately. Blanching at this temperature was reported to be effective in retaining the attractive green colour. The blanched leaves did not show any off-flavour.

(d) Puree preparation

The blanched leaves after draining water were transferred into a stainless steel pulper

for the preparation of puree. The screen of 1/8th to 3/16th inch sieve was used which helped in removing the coarser particles and hard stems etc.

(e) *Brining*

The puree was brought to a temperature of 190°F in a stainless steel container by continuous stirring. Salt was added at the rate of 1.5 per cent before it was filled into previously sterilized No. 1 picnic plain cans. The puree and salt were well mixed. This operation was carried out quickly to prevent lowering of temperature before filling. Care was taken to maintain the head-space at 3/16th inch.

(f) *Exhausting*

Since in mustard and spinach puree packs, heat penetration is reported to be by conduction, a high filling temperature (190°F) was maintained before closing the can and delay reduced between closing and sealing. Preliminary trials involving varying periods of exhausting from 5-6 minutes reveal inadequacy of this treatment as the cans bulged in majority of the cases during subsequent processing. Hence exhausting was done for fifteen minutes at 190°F. This treatment insured a can centre temperature of 180°F before sealing.

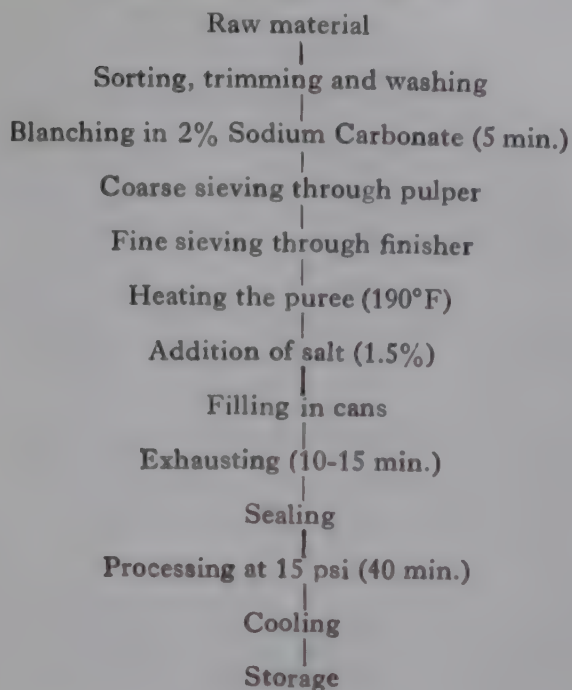
(g) *Sealing and processing*

The cans were sealed and processed at 252°F for 40 minutes as given in the flow sheet (Figure 1) in order to be on safe side to prevent microbial spoilage as against 240°F suggested by Lock Arthur¹.

(h) *Cooling*

The processed cans were rapidly cooled with constant agitation in running tap water for about 30 minutes till the temperature of the can was brought down to 80°F and then stored in order to evaporate superficial moisture.

FIGURE 1. *Flow sheet for the preparation of Mustard and Spinach puree*



2. *Mustard and spinach strained puree or strained baby food*

The puree as obtained earlier was discharged through a fruit pulper. The 'finished' or 'fibre-free puree' was collected in a stainless steel container and preheated to 190°F. Filling, exhausting, sealing, processing and cooling were followed as before but additional sugar was added to the finished puree to a level of 1.5 per cent.

Frozen pack vegetables

It is clear from the above that the representative lots of puree and strained puree were heated to 180-190°F to inactivate the oxidative enzymes. In the case of strained puree, sugar was added at the rate of 1.5 per cent. The samples were cooled to room temperature and packed in high density (500 gauge) polythene bags (50 g bag). The samples were kept in the ice chest (0°C) of Kelvin's refrigerator.

Storage study of frozen mustard puree, spinach puree and spinach strained puree was carried out for two months. The samples of frozen products were seasoned and assessed after 15 days for their quality

attributes. The overall quality test was done by a panel of five judges. The judges were asked to evaluate the coded samples as very good (4), good (3), fair (2), poor (1) and unacceptable (0). They were also asked to evaluate the same for overall quality test performance for flavour, colour, texture, appearance and overall acceptability.

The frozen unblanched and blanched pack was also analysed for chlorophyll and β -carotene contents by standard methods³.

3. Canning of 'Sarson-Ka-Sag' (Prepared Mustard Greens)

Fresh spinach and mustard greens were procured as stated earlier. In the household, mustard leaves are invariably cooked in the form of a puree which is thickened and seasoned with onions, garlic, spices and some tomatoes. The cooked vegetable is finished with the incorporation of fried onions to impart good flavour. The proportion of these ingredients vary but the recipe for the preparation of 'SAG' was standardized for canning which represents a fair average of the traditional custom.

Recipe	Material	Weight (g)
	Chopped mustard greens	800
	Chopped spinach	200
	Onions	150
	Ginger	70
	Garlic	25
	Tomatoes	100
	Ghee	100
	Salt	15
	Chillies powder or green chillies (5-6)	10

Method

The stalks and wilted leaves were removed. Leaves were washed for four times to remove dirt and sand, etc. They were cut into small pieces with knife or chopped coarsely (with Dattar) and cooked under pressure at 15 psi for 15-20 minutes. The cooked material was homogenized in a waring blender. Onion, garlic, ginger

and tomatoes were homogenized separately and fried in fat to a light brown colour. To this, cooked homogenized leaves were added and the contents were again cooked for about 5 minutes until temperature of 180°F was attained throughout the mass. This was filled hot into cans, exhausted, sealed, processed and cooled as followed in the canning of puree.

These cans were stored for three months at room temperature and the samples were subjected to cut-out analysis. The overall quality test was done by a panel of judges after three months of storage. The judges were asked to grade the samples on the basis of flavour, colour, consistency and overall acceptability.

The frozen seasoned puree, strained puree and canned 'Sarson-Ka-Sag' were further subjected to the following tests:

Organoleptic evaluation: A sensory evaluation of the seasoned puree and strained puree was done after 15 days for a period of two months. A panel of five judges was selected for the evaluation and an evaluation chart was used for the purpose. The results were statistically analysed in terms of average scores for different characteristics of each product and were subject to analysis of variance, appropriate to the design of the experiment.

Results and Discussion

(1) Effect of storage on the stability of chlorophyll and β -carotene content of frozen puree and strained puree

Storage studies on frozen mustard greens puree and spinach puree showed that enzyme action was the major cause of colour deterioration. The unblanched samples showed a greater deterioration though very gradual (Table 1) although the sample was still in the frozen state. Chlorophyll breakdown in blanched mustard greens puree stored at 0°C for two months comes upto the level of 24 per cent which suggests an

acceptable colour according to Kabigting⁴. Destruction of β -carotene in green leafy vegetables stored in frozen state was negligible as compared to the respective canned product.

Storage study of frozen mustard puree, spinach puree and spinach strained puree was carried out for two months. The

TABLE 1. *Effect of storage on the stability of chlorophyll and β -carotene content of frozen mustard puree*

Storage period (days)	Chlorophyll content (mg/g)		β -carotene content (mg/100 g)	
	Unblanched	Blanched	Unblanched	Blanched
Raw	0.725	N.D.	1.21	N.D.
15	0.688	0.615	1.12	1.05
30	0.666	0.594	1.11	1.04
45	0.594	0.572	1.11	1.04
60	0.543	0.550	1.11	1.04

N.D.=Not done

samples of frozen products were seasoned and assessed at various storage intervals for their quality attributes. The analysis of variance for spinach puree and strained puree revealed non-significant difference among the samples for overall acceptability at 1 and 5 per cent levels of significance (Table 2).

The analysis of variance for frozen mustard puree revealed significant and non-significant difference among samples and panelists respectively for overall acceptability at 1 and 5 per cent of significance (Table 3). This might be due to the contribution of colour due to better retention of chlorophyll. Colour retention, on the other hand, itself was a disadvantage since most of the people did not like bright green colour (obtained by the method) in the puree after cooking.

The frozen spinach improved in taste on storage whereas the puree from mustard greens developed a characteristic bitter after taste which was actually reflected in a lower rating of the product. The colour was, however, bright green.

TABLE 2. *Analysis of variance chart of frozen spinach puree and strained puree*

Source of variance	df	SS	MS	F	Significant at	
					1%	5%
Sample	4	1.8	0.45	2.38	Non-significant	Non-significant
Panelists	5	2.7	0.54	2.8	Non-significant	Significant
Error	20	3.8	0.19			
Total	29	8.3	0.286			

TABLE 3. *Analysis of variance chart of frozen mustard puree*

Source of variance	df	SS	MS	F	Significant at 1%	5%
Sample	3	5.50	1.83	8.30	Significant	Significant
Panelists	5	1.25	0.25	1.13	Non-significant	Non-significant
Error	15	3.25	0.22			
Total	23	10.00	0.434			

TABLE 4. *Effect of processing and storage on the stability of chlorophyll and β -carotene of canned 'Sarson-ka-Sag'*

Name of the product	Storage period (month)	Chlorophyll (mg/g)	β -carotene (mg/100 g)	Moisture content (%)	Chlorophyll retention (%)	β -carotene retention (%)
Fresh leaves	0	1.30	2.6	89.0	—	—
Uncooked sag	0	1.27*	2.5*	82.7	100	100
Cooked sag	0	0.655	2.0	76.8	52	80
Cooked sag	3	0.40	1.9	76.8	32	78

* Results are on 'Sag' moisture basis (i.e. 76.8%). External appearance of cans before opening was sound and normal in all the cases. Vacuum was 5" mercury in all cases. Appearance of the product on opening was attractive.

For cooking conventional dishes, frozen spinach required only 5-10 minutes, whereas mustard greens required a longer cooking time (about 30 minutes). The above mentioned bitterness in frozen mustard greens puree was greatly reduced on cooking. This could also be reduced by blending the former with spinach puree.

(2) *Effect of processing and storage conditions on the stability of chlorophyll and β -carotene of canned 'Sarson-Ka-Sag'*

The average of duplicate samples for the total chlorophyll content of fresh mustard greens was 1.25 to 1.30 mg/g (Bhupinder Kaur and Manjrekar)⁵ whereas canned 'Sarson-Ka-Sag' had only 0.655 mg/g (Table 4). The loss of chlorophyll was due to the heat treatment, i.e. blanching, cooking, exhausting and processing during canning. On the other hand, β -carotene was little affected during the canning of 'Sag'.

The process for the canning of mustard greens puree (Sarson-Ka-Sag) has been standardized and on the whole canned Sarson-Ka-Sag is an excellent product having good appearance, texture and characteristic pleasant flavour.

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PROCESSING OF BRINJAL

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Introduction

One of the major problems associated with the processing of vegetables is discolouration mainly resulting from either the oxidation and metal-complexing reactions of polyphenolics¹ or from decolouration of skin pigments and chlorophyll by leaching and chemical or biochemical reactions². The problem of discolouration assumes special significance in case of brinjal (*Solanum melongena*) because of the active polyphenol oxidase system and high concentration of phenolics³. In the present study, therefore, four varieties of locally available brinjals were studied with respect to chemical composition and processing by dehydration and canning.

Materials and Methods

Materials

Four commonly available brinjal varieties in Western India differing in size, shape and colour were selected for the present study. These were (i) Purple-oval (12×8 cm); (ii) Purple-long (10×5 cm); (iii) Black-roundish (6×5 cm); and (iv) Greenish whitelong (8×4 cm).

Analytical methods

Moisture was determined by drying the weighed homogenised sample at 110°C over night to constant weight. Ash content was estimated by the A.O.A.C. method⁴. Determination of protein was done by Kjeldahl method⁵ and fat by Soxhlet extraction method⁶. Total reducing sugars in

brinjal were estimated by the method of Munson and Walker⁷. Vitamin C and carotenes were estimated following the A.O.A.C. method^{8,9}. Total phenolics in the water extracts of brinjal were estimated by the Folin-Denis method.¹⁰ The total free amino acids in the concentrate of a methanolic extract of brinjal were determined by the method of Moore and Stein¹¹.

For measurement of discolouration, 100g of chilled, peeled and cut pieces of brinjal were homogenized with 400 ml water and filtered through muslin cloth followed by centrifugation at 5000 r.p.m. at 0°C. Enzymic discolouration of the clear supernatant was determined by carrying out the reaction at 30°C for 10 min. and measuring the change in colour at 420 m μ in Klett-Summerson Photoelectric Colorimeter. In case of non-enzymic discolouration, the water extract was allowed to remain at 100°C for 10 min. and the change in colour was measured as above.

Dehydration

Fresh and firm brinjals of uniform size were thoroughly washed in running water, trimmed and cut into four uniform longitudinal segments parallel to the vertical axis and cubes or slices of different dimensions. These pieces were immediately subjected to blanching in boiling water or steam for varying length of time or pre-treated as described later. After draining, the pieces were dried using a cross-flow cabinet-drier, fluidized-bed drier or a shelf-type vacuum drier. After drying, the products were

packed in polythene bags (0.0016 in. thick) and stored in desiccators at room temperature. Drying ratio, rehydration ratio, and moisture content of the dehydrated products were determined by the method recommended in the 'Indian Standard Specifications for Dehydrated Cabbage'.¹²

The colour value of the dehydrated brinjal was determined by measuring the absorbance of methanol extract at 420 m μ using ERMA Photoelectric Colorimeter model AE-11, after one hour extraction of 5 g sample with 100 ml methanol and filtration. Sulphur dioxide from the pulverized products was distilled off from acidic solution and estimated iodimetrically by the method of Ponting and Johnson¹³. Peroxidase activity of the water extract of the dehydrated brinjal was tested by following a modified method of Vetter *et al.*¹⁴. 5 ml of the extract were mixed with 0.2 ml of 1 per cent aqueous O-phenylene diamine HCl and 0.2 ml of 0.3 per cent H₂O₂. Absorbance at 450 m μ was measured in a Beckman DU spectrophotometer.

Canning

Fresh and firm brinjals were washed thoroughly and dipped in 2 per cent brine solution. After equally distributing the pieces in A 2½ cans, the cans were filled with 2 per cent brine leaving 6 mm head space. The cans were exhausted at 212°F for 7 min., sealed and processed at 10 psi for 25 min. Cans were then cooled, dried, labelled and stored.

The cans were examined for adequacy of processing, can fill, per cent disintegration, per cent water absorption and indices of browning and leaching of skin pigments.

The index of browning was determined as the intensity of brown colour of the drained solution measured at 420 m μ and expressed as the Klett units equivalent to the intensity of brown colour of the drained solution per 100 g of brinjal canned. The index of leaching of skin pigments were

determined as the intensity of purple colour of the drained solution measured at 500 m μ and expressed above.

Results and Discussion

Results presented here represent averages of at least four independent determinations on the samples purchased in different seasons. After removal of the stalks, the whole brinjal forms the edible portion averaging about 80-92 per cent of the intact vegetable. Table 1 represents the proximate composition of the four varieties of brinjal. Of the four varieties analysed, the third variety contained the highest amounts of ash (0.81 per cent), protein (1.75 per cent), reducing sugars (5.74 per cent), phenolic compounds (194 mg per cent), free amino acids (59 mg per cent) and vitamin C (5.3 mg per cent). The extent of decolouration, both enzymic and non-enzymic, was also found to be higher (0.35 and 0.74 Δ Klett units per ml per min. respectively) in the third variety. Comparing the contribution of the two types of discolouration reactions, it is seen that the non-enzymic type contributes more than double of that due to enzymic agencies alone.

It is seen from the results that the content of phenolic compounds varies widely in the four varieties, the second, third and fourth varieties containing respectively 20, 100 and 50 per cent more than the first type. However, both the enzymic and non-enzymic brownings do not necessarily parallel the content of phenolics. Thus, the enzymic browning was 32, 40 and 16 per cent higher in the three varieties as compared to the first type whereas non-enzymic browning was same in the first two varieties, about 28 per cent higher in the third variety and 8 per cent lower in the green variety. This shows that the nature of the phenolic compounds as well as the concentration of the oxidative enzymes must be different in the four varieties. From these results, it can be seen that the first variety may be the best

TABLE 1. *Proximate composition of brinjal varieties*

Contents		Varieties			
		I	II	III	IV
		Purple-oval dia.=8 cm length=12 cm	Purple-long 5 cm 10 cm	Black roundish 5 cm 6 cm	Greenish white-long 4 cm 8 cm
Average weight	g	155	95	86	63
Weight of edible portion	g %	92.26	89.49	92.12	80.10
Moisture	g %	93.70	92.75	92.10	93.55
Ash	g %	0.76	0.79	0.81	0.77
Protein	g %	1.13	1.56	1.75	1.43
Fat	g %	0.51	0.41	0.32	0.55
Total reducing sugar	g %	3.73	4.17	5.74	3.21
Vitamin C	mg/100 g	4.70	5.20	5.30	4.30
Carotenes (as β carotene)	μ g/100 g	630	570	530	430
Phenolic compounds (as tannic acid)	mg/100 g	98	119	194	146
Free amino acids (as leucine)	mg/100 g	51	54	59	48
Discolouration					
(a) Enzymic (Δ Klett units/ min./ml)		0.25	0.33	0.35	0.29
(b) Non-enzymic (")		0.58	0.59	0.74	0.53

TABLE 2. *Drying of brinjal by different methods*

Driers used	Drying ratio	Moisture content%	Colour value (O.D.)
1. Fluidized-bed drier (Temperature = 75°C; Drying Time=2½ hr.)	12	5.2	0.09
2. Cabinet-drier: (Temperature= 75°C; Drying Time=10 hr.)	11.5	9.1	0.25
3. Vacuum drier: (Vacuum=18"; Temperature= 75°C; Drying Time=12 hr.)	10.9	9.7	0.19

for processing whereas the black variety appears to be the most problematic.

Drying of black-roundish brinjals was first carried out in a fluidized-bed drier, varying the thickness of slices as well as drying temperature. Pretreatments given were blanching in boiling water for 3-4 min. and dipping in 0.25 per cent sodium metabisulphite solution for 15 min. In this study it was found that slices of 3 cm thickness were suitable. The optimum drying temperature was found to be 75°C. A thickness above 3 cm delayed the drying time and enhanced the browning. Optimum drying time required under these conditions was found to be 2.5 hr. Making use of these conditions of pretreatment and drying, cabinet and vacuum driers were

also tried and the results compared for drying ratio, moisture content and colour value of the products. The results are presented in Table 2.

When comparing the drying ratio of the products, a higher value of 12 is achieved in case of fluidized-bed drying than that of 11.5 and 10.9 respectively in cabinet and vacuum driers. Moisture content and colour value also were kept to a minimum of 5.2 per cent and 0.09 respectively in case of fluidized-bed dried products. Drying time for tray and vacuum driers was 10 and 12 hr. respectively which was considerably long when compared to 2.5 hr. for fluidized-bed drying.

As in the case of other vegetables, the rate of deterioration by non-enzymic browning could be greatly retarded by reducing the moisture content of the product to a low level¹¹. This could, therefore, be done more effectively in a fluidized-bed drier.

Vegetables are normally blanched before drying so as to minimize the discolouration by inactivating the enzymes¹⁰⁻¹². In case of brinjal, water blanching results in increased brown colouration, hence steam blanching was tried for various time periods. In both the cases, 3 min. blanching produced almost the same colour value. An extended drying time was needed whenever the samples were blanched either in boiling water or in steam. Hence, blanching was dispensed with and only sulphite dip was tried. The above observations are summarized in Table 3.

It is well known that sulphite dips help in reducing enzymic as well as non-enzymic browning¹³. It was found that sulphite dip alone could minimize the most undesirable browning reaction during drying, to as low a colour value as 0.04. From the minimized colour value of sulphite dip products, it was expected that the enzymic discolouration during dipping and subsequent drying could have also been possibly retarded. Other chemicals such as citric acid,

Table 3. Effect of different pre-treatments on colour value of the fluidized-bed dried brinjal

Pre-treatments	Colour value of the dehydrated brinjal (0.125)
1. Control (dipped in water for 15 min.)	0.11
2. Blanching	
(a) In boiling water for 3 min.	0.13
" for 5 min.	0.11
(b) Open steam blanching	
" for 1 min.	0.13
" for 3 min.	0.15
3. Without blanching but with immersion for 15 min. in	
(a) Sodium metabisulphite (0.5%)	0.04
(b) Citric acid (0.5 %)	0.12
(c) Sodium chloride (0.5 %)	0.14
(d) Sorbitol (0.5 %)	0.18
(e) Pyrophosphate (0.5 %)	0.21
(f) EDTA (0.1 %)	0.28
4. Blanching in boiling water for 3-4 min. and dipping in 0.25 % sodium metabisulphite for 15 min.	0.09

sodium chloride and sorbitol also substantially reduced the browning whereas pyrophosphate and EDTA had little effect on the discolouration reaction (Table 3). Even the combined effect of blanching and sulphite dip did not equal the effect of sulphite dip alone, although in this experiment the concentration of metabisulphite employed was lower.

Table 4 shows the effect of sulphite dip on the sulphur dioxide content and the colour value of the dehydrated brinjal. The optimum concentration of sodium metabisulphite in the dip solution was found to be 0.45 per cent. At this concentration, the level of sulphur dioxide present in the dehydrated product was 1375 ppm which is well within the limit of tolerance of 1500-

2000 as per Indian Standard specification for many dehydrated vegetables¹².

Table 5 shows the characteristics of the dehydrated brinjal obtained by an optimized process. The rehydration ratio achieved of a product containing 4.5 per cent moisture and 1375 ppm sulphur dioxide was 9. The peroxidase activity was found to be absent in the dehydrated product while in the fresh vegetable only a trace could be detected.

Table 6 shows the changes in moisture content, sulphur dioxide content and rehydration value of dehydrated brinjal on storage upto 6 months. There was a reduction in sulphur dioxide content of the product from 1375 to 1125 ppm on storage for 6 months at 30°C. Moisture content increased to 5.1 per cent from 4.5 per cent. Rehydration ratio, on the other hand, remained the same. There was no appreciable change in colour which increased from 0.04 to only 0.07 in 6 months.

The cut-out report of brinjals canned in 2 per cent brine is presented in Table 7. The can fill of brinjal was achieved to above 60 per cent, when tried with both blanched and unblanched material. For a size of 1/16 of brinjals, the blanched pieces gave per cent fill of 67 as compared to that with unblanched ones of 63 per cent. Blanching and size reduction increased percentage water absorption in brinjals canned in brine. The values of 11.4 and 13.75 per cent respectively for unblanched and blanched brinjals of 1/16 size and 29.9 and 34.2 per cent respectively for unblanched and blanched brinjals of 1/32 size were observed. Percentage disintegration increased when brinjals were blanched and the size reduced. The unblanched brinjals of 1/16 size gave disintegration of 9.8 per cent, while the blanched ones gave 10.5 per cent. On reducing size of the pieces from 1/16 to 1/32, the unblanched brinjals showed 26 per cent and the

TABLE 4. Effect of concentration of sodium metabisulphite in dip solution on the SO₂ content and colour value of the fluidized-bed dried brinjal

Concentration of sodium metabisulphite in the dip solution.* %	SO ₂ in dehydrated brinjal (ppm)	Colour value of dehydrated brinjal (O.D.)
0	0	0.31
0.1	560	0.29
0.2	850	0.26
0.3	1120	0.18
0.4	1250	0.07
0.45	1375	0.04
0.5	1450	0.04

* Dip for 15 min.

TABLE 5. Characteristics of the dehydrated brinjal obtained by an optimized process

Product characteristics	Values
1. Drying ratio	12
2. Moisture content	4.5%
3. Sulphur dioxide content	1375 ppm
4. Peroxidase activity	nil
5. Rehydration ratio	9

Conditions employed	
(a) Thickness of slices	3 cm
(b) Concentration of sodium metabisulphite in dip solution	0.45%
(c) Drying temperature in fluidized-bed drier	75°C
(d) Drying time	2½ hr.

TABLE 6. Storage characteristics of the dehydrated brinjal

Characteristics	Storage period (months)*			
	Fresh	1	3	6
1. Moisture (%)	4.05	4.6	4.75	5.1
2. Colour value (O.D.)	0.04	—	—	0.07
3. SO ₂ content (ppm)	1375	—	—	1125
4. Rehydration ratio	9	9	9	9

* The dehydrated brinjals were packed in polythene bags (0.0016 in.) and stored at 30°C.

TABLE 7. *Cut-out report of canned brinjal in brine*

1. Size of brinjal pieces	1/16	1/32	1/16	1/32
2. Treatment	Unblanched	Unblanched	Blanched	Blanched
3. Weight of brinjal per A 2½ can (g)	462	354	475	365
4. Total weight of the can after processing (g)	750	700	730	690
5. Drained weight (g)	470	370	490	390
6. Weight of disintegrated particles (g)	45	90	50	100
7. % Fill	63	53	67	57
8. % Disintegration	9.8	26	10.5	27.4
9. % Water absorption (corrected for the disintegration)	11.4	29.9	13.75	34.2
10. Intensity of brown colour of the drained solution measured at 420 m μ (Klett units)	182	168	245	260
11. Index of browning (Klett units per 100 g of brinjal pieces)	39.5	47.5	52	71
12. Intensity of purple colour of the drained solution measured at 500 m μ (Klett units)	110	116	96	92
13. Index of leaching of skin pigments (Klett units per 100 g of brinjal pieces)	24	32.8	20	25

blanched pieces showed 27.4 per cent disintegration.

The colour of the drained solution showed pronounced browning in case of blanched brinjals and to a lesser extent in case of unblanched brinjals. The low leaching indices of 20 and 25 for blanched and 24 and 32.8 for unblanched brinjals show that a high degree of disintegration of anthocyanins takes place in blanched brinjals. The fact that the products were brown on blanching and subsequent processing shows the predominant contribution of non-enzymic discolouration. This clearly reveals that blanching did not help much in improving the colour of the product not only in canning but also in dehydration. The blanching step thus appears to be unnecessary.

Summary

The proximate composition of four brinjal varieties was determined. Quantities of

moisture, ash, protein, fat and carbohydrate in addition to the minor constituents such as vitamin C, carotenes, phenolic compounds and free amino acids which contribute to both enzymic and non-enzymic discolourations were reported.

The black-roundish variety was shown to have the highest discolouration index and hence selected for the preservation study.

Dehydration was tried using fluidized-bed, cabinet and vacuum driers. Fluidized-bed drying was found to give the best results. The products were evaluated by objective analysis for moisture and colour. Treatment with metabisulphite before drying improved the product considerably. The blanching step was found unnecessary. Chelating agents had no effect on colour improvement. For an optimized process the drying ratio was determined to be 12. Residual sulphur dioxide content was 1375 ppm. The rehydration ratio was 9. On

storage upto 6 months at room temperature, there was no change in rehydration value. Not much change in colour was also encountered.

The conditions for canning were also optimized and the data have been presented.

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NATURE AND APPLICATION OF PECTINASES WITH SPECIAL REFERENCE TO FRUIT AND VEGETABLE PROCESSING INDUSTRY

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Abstract

Enzymes are one of the most important tools in modern industry. Bulk of the industrial enzymes fall into 4 or 5 groups of which pectinolytic enzymes are important in fruit processing industry. This review discusses the occurrence of pectic substances in fruits and other plant tissues, chemistry of pectic substances, their importance in fruit and vegetable processing, production of pectic enzymes from microbial sources and commercial application of pectic enzymes.

Introduction

Enzyme catalysed reactions have been employed by man since time immemorial in producing wine, bread, cheese, leather and fermented foods even though he did not know that the reactions were enzymatic. Soon after the recognition of enzymes as causative agents of many organic reactions, crude preparations were being utilised in industrial applications. An estimate, prepared in 1965 (Narahari Rao *et al.*) on the requirement of industrial enzymes in India, indicated that nearly 600 tonnes valued at 6 million rupees is required annually, of which nearly 70 per cent is being imported. There is ever-increasing demand, not only for large quantities of enzymes already in use, but also for newer enzymes and finding out newer uses for the existing ones (for example: proteolytic enzymes in detergents, milk clotting enzymes for cheese making, pectinase in wood preservation, ring cleaving enzymes to prevent browning in processed foods etc.).

One of the most important group of enzymes used in fruit and vegetable proces-

sing industry is pectinases. Use of pectic enzymes for clarifying fruit juices was introduced by Kertesz (1930) in the United States of America and by Mehrlitz (1930) in Germany. Since then pectinases have found many industrial applications. This article is a review of the information available on the above mentioned topic.

Occurrence and Nature of Pectic Substances

Pectin is a naturally occurring, high molecular weight carbohydrate. It is one of the most important polysaccharides used in food industry. Pectic substances occur in all higher plants and distributed in the inter-cellular spaces (the middle tornella) of the plant tissue. The major biological role of pectin is that of a cementing material. A committee appointed by the American Chemical Society in 1944 has defined pectic substances (Kertesz, 1944) as follows:

Pectic substances are a group of complex colloidal carbohydrates which occur in or prepared from plants and contain a large proportion of anhydrogalacturonic acid units. The carboxyl groups of polygalac-

turonic acids may be partially esterified by methyl groups or partly or totally neutralized by one or more bases.

Protopectin is the name given to the native substance in plant material which is highly cross-linked and consequently insoluble in water and other solvents. Prolonged extraction with dilute acid results in the soluble pectinic acids.

Pectins include those water soluble pectinic acids of varying methyl ester content and degree of neutralization, which are capable of forming gels with sugar and acid under suitable conditions.

Pectinic acids are those colloidal polygalacturonic acids containing more than a small proportion of methyl ester groups. Pectinic acids under suitable conditions are capable of forming gels with sugar and acid; if the methoxyl content is lower, then gel formation may take place with certain ions. The salts of pectinic acids are either normal or acid pectinates.

Pectic acid is the name applied to pectic substances composed of colloidal polygalacturonic acid and is essentially free of methyl ester groups. The salts of pectic acids are either normal or acid pectates.

The term pectin designates pectinic acids containing at least 7 or 8 per cent methyl ester groups, expressed as methoxyl, and

capable of forming gels (jellies) with sugar (or polyhydroxy compounds) and acid under suitable condition. Low ester (low methoxy) pectins are a group of pectinic acids containing 3 to 7 per cent methoxyl in contrast with the usual 7 to 12 per cent in pectins. An ideal pectinic acid, in which all carboxyl groups are esterified, would contain 16.3 per cent methoxyl (theoretical maximum) but all attempts to isolate such a compound have failed, even though preparations containing over 14 per cent methoxyl have been reported.

The structure of pectin and pectic acid molecules are given in Fig. 1.

For sometime it was believed that pectic substances were absent in lignified plant tissues, but with improved methods of extraction, they have been found in all plant tissues, including woods, although their proportion is exceedingly low in many cases.

In most succulent plant tissues, the total pectic substances, on fresh weight basis, amount to approximately 0.5 to 1.0 per cent. In some tissues like citrus peel, orange flavedo, etc. the proportion may reach 4 to 5 per cent and in certain particular tissues the content is much higher. Pectin content of some fresh fruits and of some dried plant parts as reported by Ward and Fogarty (1972 a) are given in Table 1.

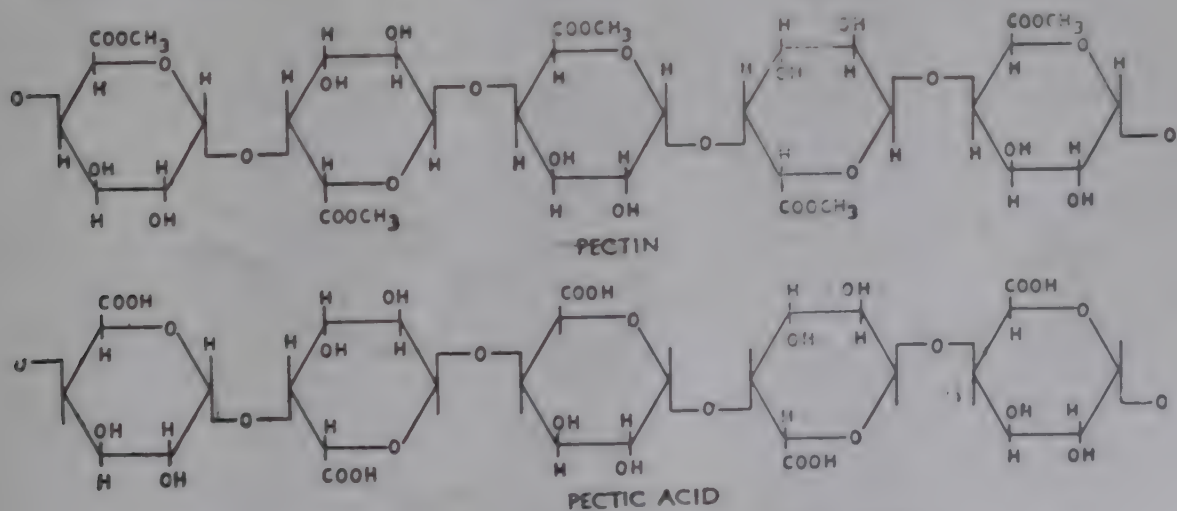


Fig. 1 Structure of Pectin and Pectic Acid

Pectinolytic enzymes

Pectic substances, which are universally present in plant tissues, are degraded by a number of pectinolytic enzymes. Basically 3 types of pectic enzymes exist, pectin-esterase (pectin methyl-esterase) (EC 3.1.1.11) which removes methoxyl residues from

TABLE 1. Pectin content (%) of some fresh fruits and dried plant parts

Material	Per cent pectin as calcium pectate	
	Fresh fruits	Dried plant parts
Apples	0.5-1.6	4-7
Apricots	0.7-1.3	...
Bananas	0.7-1.2	...
Carrats	...	10-12
Citrus peel (albedo)	...	30-35
Currants	0.9-1.5	...
Guavas	0.7-1.5	...
Grapes	0.2-1.0	...
Grape fruit	1.6-4.5	...
Lemon peel	...	35.5
Lemon pulp	...	32.0
Lemon rind	...	20.0
Orange membrane	...	24.0
Orange juice sac	...	16.0
Pineapple	0.3-0.6	...
Pine cambium	...	16.6
Peas	0.5-0.8	...
Peaches	0.3-1.2	...
Potatoes	...	2.5
Raspberries	0.7-1.0	...
Strawberries	0.6-0.7	...
Sugar beet	...	20-30
Sun flower heads	...	25.0
Tomatoes	0.2-0.5	3.0
Tobacco leaf	...	14.12
Tobacco stem	...	14.24

pectic substances with the formation of methyl alcohol and polygalacturonic acid and a group of glycosidases (Fig. 2). Prior to 1960 it was thought that depolymerization of pectic substances was entirely due to hydrolytic cleavage. Albersheim et al. (1960) have discovered an enzyme which degrades the α -1,4-bond by translocation (Fig. 3).

In the light of recent discoveries, Fogarty and Ward (1972 a) have reclassified the pectinolytic enzymes as shown in Table 2.

In addition to the enzymes referred to in the Table 2, another enzyme which converts the insoluble protopectin in plant tissue into soluble pectinic acids has been reported and this is known as *proto-pectinase*, *macerating enzyme* (McClenden and Somers 1960). This enzyme has been referred to as *cell separating enzyme* (CSE) by Toyama (1969).

The overall reactions in the degradation of protopectin to D-galacturonic acid and the different enzymes involved in the action are given in Fig. 4.

Occurrence of Pectic Enzymes

Pectin degrading enzymes are widely prevalent and their occurrence has been reported in plants, animals (snails) and microorganisms (bacteria, actinomycetes, yeasts and moulds). Plant enzymes require growing of a large quantity of plant material. Therefore, large areas of land have to be brought under specific variety of plants to

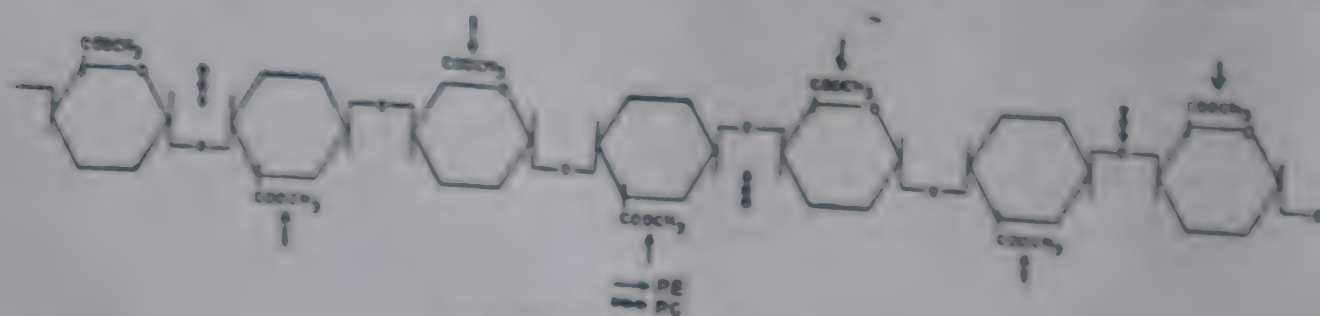


Fig. 2 Site of Action of Pectin-esterase (PE) and Polygalacturonase (PG) on Pectin

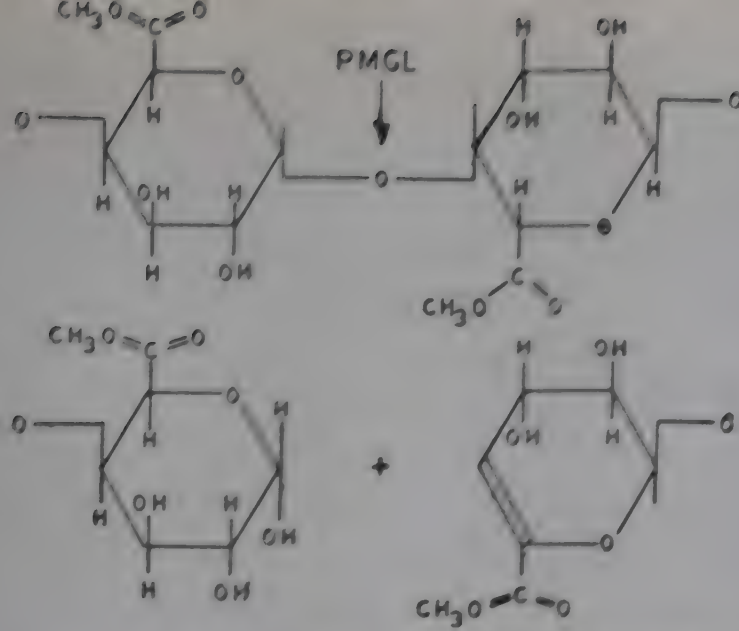


Fig.3 Action of polymethylgalacturonate transeliminase PMGL on pectin

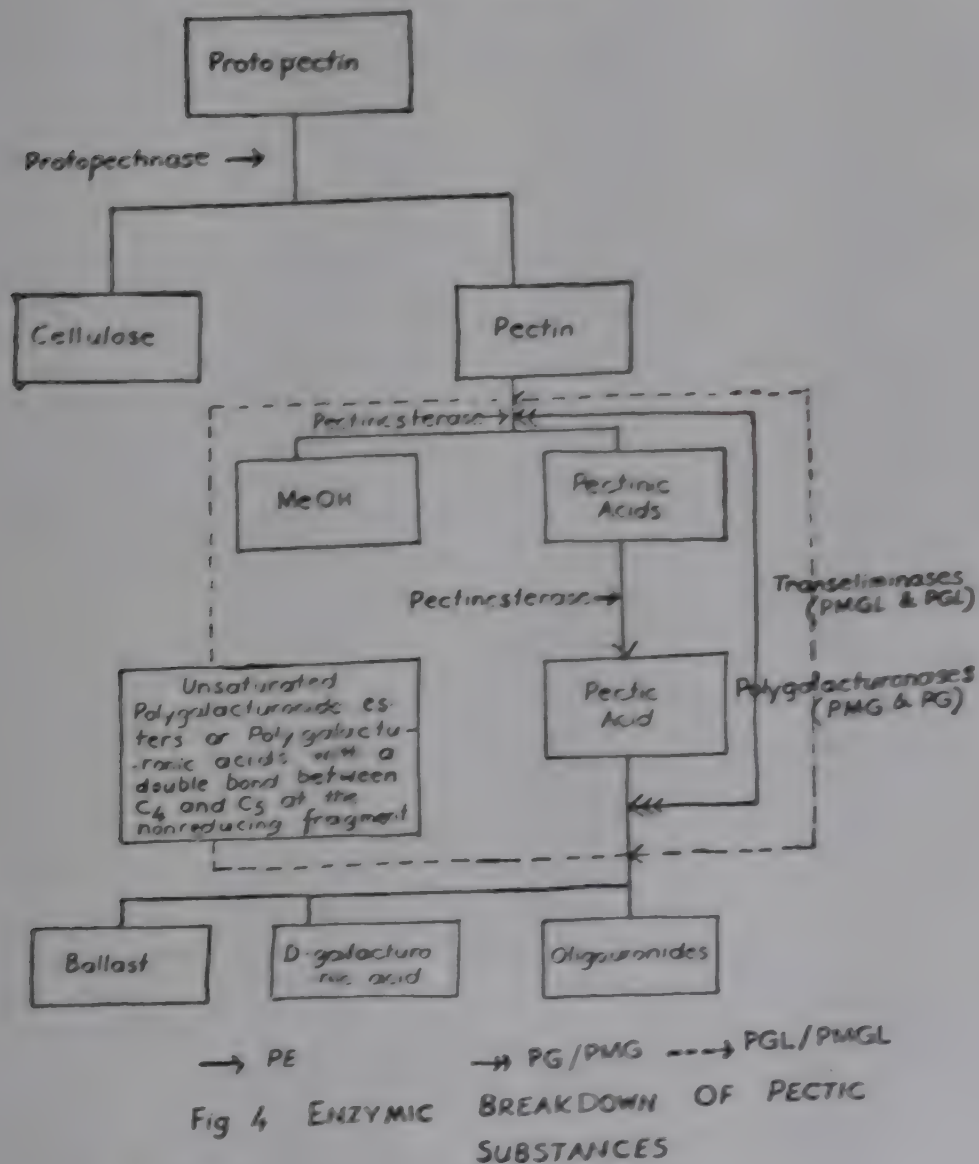


Fig 4 ENZYMIC BREAKDOWN OF PECTIC SUBSTANCES

TABLE 2. Classification of pectin degrading enzymes

Acting on pectin	
1. Pectin methyl esterase (EC 3.1.1.11)	Catalyses the hydrolysis of methyl ester groups in pectin.
2. Polymethylgalacturonase (PMG)	
(a) Endo-PMG (EC 3.2.1.41):	Causes random cleavage of α -1, 4-glycosidic links of pectin (preferentially highly esterified).
(b) Exo-PMG	Causes sequential cleavage of α -1, 4-glycosidic links of pectin from the non-reducing end of the chain.
3. Polymethylgalacturonate lyase (PMGL)	
(a) Endo-PMGL (EC 4.2.2.3):	Causes random cleavage of α -1, 4-glycosidic links of pectin by transeliminative process which results in galacturonolactones with unsaturated bonds between C ₄ and C ₅ at the non-reducing end of the fragment formed.
(b) Exo-PMGL	Causes stepwise breakdown of pectin by transeliminative cleavage.
Acting on Pectic Acid	
1. Polygalacturonase (PG)	
(a) Endo-PG (EC 3.2.1.15)	Causes random hydrolysis of α -1, 4-glycosidic links in pectic acid (Polygalacturonolactone acid).
(b) Exo-PG (EC 3.2.1.40)	Hydrolyses in a sequential fashion of α -1, 4-glycosidic links in pectic acid.
2. Polygalacturonatase (PGL)	
(a) Endo-PGL (EC 4.2.2.1)	Causes random cleavage of α -1, 4-glycosidic bonds in pectic acid by process of transelimination.
(b) Exo-PGL (EC 4.2.7.2)	Causes sequential cleavage of α -1, 4-glycosidic bonds in pectic acid by a process of transelimination.

TABLE 3. Optimum pH of pectinolytic enzymes from different sources

Source	pH optimum (range)
Plant	6.6 to 8.0
Bacteria	6.0 to 8.0
Actinomycetes	6.8 to 7.6
Yeast	4.0 to 4.8
Fungi	3.0 to 6.0
Animal (Snail)	4.0 to 7.0

enzyme preparations are preferred since the pH optima of these enzymes falls within the range found naturally in many fruits. pH range at which pectinolytic enzymes from different sources are active are presented in Table 3.

Commercial Production of Pectic Enzymes

Details relating to the commercial production of pectic enzymes are very sparse. Commercial pectic enzymes are generally obtained from fungal sources. In the majority of cases microorganisms produce a variety of pectin degrading enzymes and often the commercial preparations contain many of these fractions. The relative amounts of the respective enzymes produced will vary considerably with the particular strain used, nutrient composition and various environmental factors. Enzymes are marketed in various forms and potency, viz. mouldy bran, liquid enzyme concentrates, crude and refined powders. Selection of individual preparation will depend on its suitability for a given processing. Some of the enzymes developed in our laboratory are compared with similar commercial preparations and their activities are presented in Table 4. Three kinds of enzyme preparations are produced viz. mouldy bran (MB), liquid enzyme concentrate (LEC) and crude enzyme powder (CEP).

have enough raw material for separating the enzyme. In the case of enzymes from animal sources rearing or procurement of sufficient number of animals is a tedious business. In contrast, production of microbial enzymes can be stepped up depending on the demand. Moreover, specific microorganisms can be selected to produce the desired enzyme, as the kinds of enzymes available from microorganisms are unlimited. For industrial purposes microbial

TABLE 4. Comparative activities of different pectinolytic enzyme preparations

	VR	PG	PE
IB (wheat bran) 1% ext.	62.8	4.0	1.86
MB (rice bran) 1% ext.	47.0	3.0	—
Commercial MB-I 1% ext.	57.1	2.0	2.54
Commercial MB-II 1% ext.	61.4	4.0	2.48
PEC (1:10 dilution)	54-72.0	3.0	1.86
Precipitate (wheat bran) 0.1% sol.	65.2	2.5	0.682
Precipitate (rice bran) 0.1% sol.	56.0	2.0	—
Commercial Powder—I 0.1% sol.	68.0	3.0	0.748
Commercial Powder—II 0.1% sol.	60.8	—	—
Commercial Powder—III 0.1% sol.	68.6	—	—

VR=Viscosity reducing activity. Per cent reduction in viscosity of 1% pectin solution.

PG=Polygalacturonase: 0.05 N NaOH consumed in 1 hour (ml).

PE=Pectin esterase: m_{μ} of methoxyl groups released by 1 ml of enzyme solution per 1 hr.

Pectic enzymes can be produced by both surface and submerged method of cultivation using fungi (Beckhorn, 1960). The surface process employed is a modification of Takamine's original bran process. Wheat bran or defatted rice bran have been recognised as very satisfactory supporting substrates. Other ingredients such as nutrient salts, acid or buffers are also incorporated to regulate the pH during the growth of fungi. The moistened medium is steamed or cooked under pressure for sterilization, cooled, inoculated with mold spores and spread out in shallow trays. Inoculated trays are incubated in chambers where the humidity and temperature are controlled and are referred to as 'Koji' rooms. Instead of trays slowly rotating drums are utilized as fermentation chambers. Sterilization is also carried out within the drum itself. Temperature around 30°C are maintained in the koji room as well as in the drum. Sterile water is sprayed occasionally over the medium to maintain proper moisture.

Desired enzyme level is reached within 36 to 48 hours when strains of *Aspergillus* are used. After fermentation the bran is air dried and stabilized. This mouldy bran can be used as such as an enzyme source. For preparing the enzyme concentrates, the enzyme is extracted in suitable aqueous solutions and concentrated under vacuum at low temperatures. Crude or refined powders are prepared from the concentrated extract by clarification and precipitation with neutral salts or solvents.

The submerged method was originally developed and first adopted extensively for antibiotic production. For small scale operations the microorganisms are cultivated in flasks on a shaker or in small bench fermentors. Industrially deep tanks of several kilo-litre capacity known as fermentors are employed for submerged fermentation. Fermentors have provision for aerating the medium with sterile air and for vigorous agitation. Aeration and agitation rates, degree of dispersion of air are

standardized before carrying out large fermentations. Inocula for submerged fermentations are built up progressively starting from laboratory flasks to small seed tanks. After the desired period of growth, the mycelium is separated by filtration and the culture brew is processed in the same way as the extract obtained from mouldy bran. The enzyme preparations are standardized and stabilized before marketing.

As an example of production of pectinase by submerged fermentation, work of Nyiri and his coworkers can be cited (Nyiri, 1968, 1969 and Nyiri *et al.*, 1968). The method reported for *Aspergillus alliaceus* consists of growing the fungus in a liquid medium containing 2 per cent wheat bran, 2 per cent $(\text{NH}_4)_2\text{SO}_4$, 0.25 per cent KH_2PO_4 , 0.25 per cent yeast extract, 0.1 per cent pectin (59 per cent esterified) and traces of silicon. The pH of medium is adjusted to 3.8 with HCl. After inoculation with spores of the fungus, the pressure in the fermentor was maintained at 1.4 atm. and the medium was kept stirred at 250 rpm. One hundred cubic metres of air per hour was sparged through the medium. The fermentation was completed within 72 hr., after which the mycelium was separated by a filter. The pH of the culture broth was adjusted to 3.0 with H_2SO_4 . The filtrate was cooled to 0-1°C and 600 kg of $(\text{NH}_4)_2\text{SO}_4$ was added with stirring at 250 rpm for 4 hr. The resulting precipitate was allowed to stand for 12 hr. and dried after washing. Ten kg of enzyme having an activity of 12 units per g was obtained. Nyiri (1968 and 1969) has also discussed the fermentation and recovery of pectinase by growing a strain of *A. ochraceus* by submerged method.

The MB and PEC developed at Central Food Technological Research Institute store well even on lab bench (max. temp. 30°C-32°C) for one year losing only 33 per cent of its activity.

Application of pectinolytic enzymes

Pectin degrading enzymes are used extensively for the clarification of fruit juices and wines (Tressler and Joslyn, 1971). Its importance in fruit juice technology has been reviewed by Neubeck (1959) and its usefulness in wine making has been excellently brought out by Hickinbotham and Williams (1940). They are also useful in extracting juices from soft fruits (Sreekantiah *et al.*, 1968). Other important processes where pectic enzymes are utilized are: in the preparation of hydrolysed products of pectin (Altermatt and Deuel, 1952 a, b), in the retting of textile fibres (Bhat *et al.*, 1968), in the refinement of vegetable fibres during starch manufacture (Anon, 1968), in the curing of coffee (Johnston and Foote, 1951), cocoa (Johnston and Foote, 1954), and tobacco (Kertesz, 1951; Holden, 1951), as an analytical tool in the estimation of certain plant products (Anon, 1966) and to degrade plant tissue lamella and release plant cells in cytological and tissue culture work (Hohl, 1948; Chayen, 1952).

Extraction of juice from soft fruits

Juice can be easily expressed from fruits like lemons, oranges, tomatoes, pineapple etc. In soft fruits like guava, banana, papaya, mangoes, the juice cannot be expressed at all by the conventional methods. In certain other fruits like grapes, apples etc., extraction of juice is incomplete since some quantity of juice is retained in the pomace after expression. In the conventional process of preparing juice from soft fruits, the pulp is boiled with water and the extract is further processed (Waldt and Mahoney, 1967). An enzymic process developed at CFTRI (Sreekantiah *et al.*, 1971) enables not only expression of juice from soft fruits without drastic treatments, but also aid in the clarification of juices. The process consists of pulping the fruits (after deskinning wherever necessary) and warming it to 60-65°C for 15 minutes to inactivate the

TABLE 5. Characteristics of juice obtained from different fruits by enzyme processing

Variety	Characteristics of the juice				
	Yield		Total sugars	°Brix	Acidity %
	on whole fruit	on pulp			
Bananas*					
Benodran	70	71	22-22	22	0.76
Pattacceran	68	85	24	27	0.91
Patti Palayan	54	75	20	24	0.62
Robusta	62	89	18	21	0.45
Rasabale	64	82	18.5	19.5	0.69
Chandrabale	60	77	13	14	0.47
Poonan	57	70	13	14	0.58
Sambhani	44	60	21	27	0.73
Lakum	55	78	22	26	0.73
Caranduh	69	77	18	21	0.47
Kadubale	53	74	21	24	0.50
Guavas*					
Red		75	9.7	11	0.78
Allahabad (White)		88	7.5	11	0.37
Apples					
Maharaja		83	8.45	12	0.47
Golden delicious		88	11.15	13	0.18
American		86	11.5	14	0.63
Red delicious		85	11.3	12	0.32
Kesari		82	13	13	0.51
Grapes					
Bangalore blue		82	16.2	18	1.21
Anab-e-shahi		85	14.6	16	0.55
Selection-7		86	14.3	15.5	0.55
Bangalore purple		91	15.1	16.0	0.74
Kalishahi		86	14.9	16.0	1.06
Mango (Badami)*	63	...	14.1	16.0	0.3
Papaya*	80	...	8.0	9.0	0.47
Tomato	93	...	2.8	4.0	0.43
Jack fruit*	30	78	18.3	20.0	0.60

* Juice cannot be squeezed out from these fruits without enzyme treatment.

onate enzymes, and to prevent microbial infection (if required, adequate doses of permissible preservatives may be added to prevent microbial spoilage). The pulp is weighed and calculated quantities of pectolytic enzyme is added and mixed well. After 15-18 hr. the juice is separated out in a basket centrifuge or pressing through cheese cloth in a filter press. The juice thus obtained is racked at 3 to 5°C for 24 to 48 hr. during which period all the suspended particles settle down at the bottom.

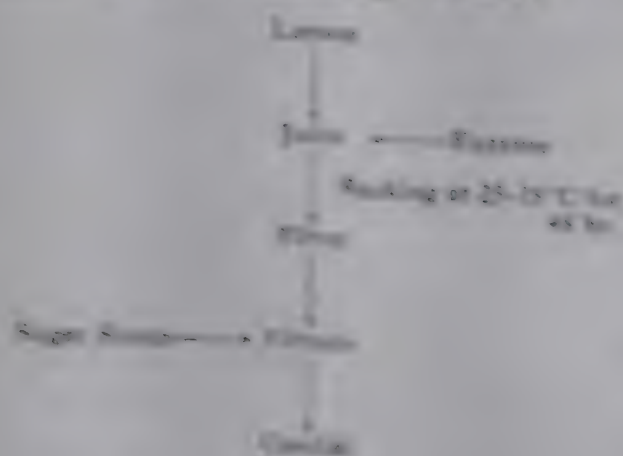
The clear supernatant is then clarified, if necessary, by using filter aids, and stored after pasteurization. By enzyme treatment, there is increase in the yield of juice from grapes and apples upto 20 per cent. Relevant information on enzymatic processing of fruits are given in Table 5.

Pectic enzymes are also used for treating citrus pulp, after the juice has been expressed once mechanically. In the Villadsen and Moller's (1967) process, pectolytic enzyme is added to the recovered pulp,

after first extraction, and hold at room temperature for 1-48 hr. or for shorter periods at elevated temperatures up to 35°C. Before pressing the juice a filter aid is added. The juice obtained is mixed with the mechanically expressed juice. This treatment can also be applied to orange pulp. The treatment results in an increased yield of 45 per cent.

Preparation of fruit cordials

Pectinolytic enzyme preparations have also been used to hasten the process of lime juice cordial production (Sreekantiah *et al.*, 1965a). It has been found that when pectinolytic enzyme is added to lime juice at 1 per cent level and allowed to react for 48 hr. at room temperature (25-35°C), it could be easily filtered and sparkling clear product is obtained. Enzymic processing does not effect the flavour or other characteristics of the product. The process not only reduces the processing time to 4 to 5 days from 4 to 6 months, but also the cost of storing the juice over long periods is eliminated. On realising the advantages of enzymic processing of lime juice for cordial preparation, some fruit processing factories have already adopted this process commercially. Flow sheet for the process is given below:



This method of producing lime juice cordial production utilising pectinolytic enzymes has also been extended to Bangalore Blue grape processing and a cordial

is prepared in a similar way (Sreekantiah *et al.*, 1976). It has also been noted during racking considerable quantity of sediment is deposited within 8 to 10 days. This will help in the recovery of tartaric for which there is a great demand in the country.

Clarification of Fruit Juices and Wine

The practice of fruit juice clarification by the use of enzymes was introduced in Germany and the United States of America in the early thirties (Mehring, 1933; Williams and Korte, 1935; Williams, 1955). Application of pectic enzymes in fruit juice technology has been dealt in detail by Neufeld (1958). Before the technique of enzymic clarification of fruit juices was adopted, methods that were in vogue for obtaining clear fruit juices were:

1. **Fining:** Suspended particles in juices exist as hydrocolloids [i.e. they are surrounded by a layer of adsorbed water]. When the colloids of opposite charge are mixed in definite proportions they neutralise each other. This is actually precipitation. This can be brought about by addition of fining agents which are polyelectrolytes to the fruit juice. There are two general types of fining agents. Small amounts of proteins like gelatin, casein or albumin, when added to a juice containing tannins, will cause coagulation of the proteins by formation of a complex which will settle down carrying with it the suspended particles. The proteins have to be used judiciously under standardised conditions. To the second type belong bentonite or other diatomaceous earth. The chief advantage is that they settle down rapidly forming a heavy sediment and they can be used without accurate control time since an excess does not cause clouding.

2. **Heat Coagulation:** Coagulation of colloids in the fruit juice can also be effected by heating the juice rapidly.

temperatures at which they prepare. Usually the juice is held at 75°C for 1 to 3 minutes and cooled rapidly. Treatment should be carried out with care as otherwise the flavour of the juice may be altered. Clarification by heating is dangerous in that it removes those substances which would otherwise precipitate during pasteurization.

Clarification by Freezing: The freezing of cloudy fruit juices often hastens their clarification because freezers alter the character of colloidal material and readily precipitates when thawed. Application of enzymes in the clarification of fruit juices aids in either partial or complete hydrolysis of the suspended fibres, proteins and pectins as the enzymes are used for this purpose show amylolytic, proteolytic, pectinolytic and cellulolytic activities. Pectic enzymes hydrolyse the soluble pectonic acids present in the juice, which serve as protective colloids for the other suspended particles present, and they lose their protective effect and allow other colloids to flocculate. The insoluble precipitate settles down leaving a clear supernatant. Pectinolytic enzymes reduce the viscosity by breaking down large pectin molecules and thus increase filtration efficiency or clarification. The temperature, pH, pectin content of the juice and type of pectin determine the quantity of enzyme required for clarification. The time necessary may vary from 3 days at 25°C to a few hours at higher temperature. Higher temperatures are not desirable for various reasons. In the process of apple and grape juice clarification the pectic enzyme preparation is added to juice and rapid drop in viscosity starts after a lag phase of 10-15 minutes. After some time haze in the juice forms a flocc which slowly settles down. The juice is then filtered through filter aids. A modified method for producing apple juice has been

developed at CIFTRI (Joshi *et al.*, 1973) wherein by judicious use of pectinolytic enzymes not only a sparkling juice is obtained but also 20 per cent of the pectin is recovered. Enzyme treated juices are ideal for preparing concentrates.

The use of pectic enzymes for wine clarification was first recommended by Cruess and Bezone (1941). It is better if the enzyme is added to the must itself before fermentation. This helps in greater yield. Heating of must prior to enzyme treatment helps in increased colour extraction (Biswas and Joshi, 1966). Deposition of argol is also hastened in enzyme treated juices. Pollard and Kiser (1951, 1953) have advocated use of pectinolytic enzymes in cider manufacture. In brewing of grapes, apples and other fruits, the addition of pectinolytic enzymes at the time of charge followed by fermentation results in the hydrolysis of the pectic substances in the fermented liquor parallel with the fermentation, yielding clear fruit wines.

Many people express concern regarding the increase in the methanol content of fruit juices and wines subjected to pectic enzyme treatment due to decarboxylation and release of methanol. This problem has been worked out by many investigators and all the reports indicate that even though the methanol content of the juice or wine increases after enzyme treatment, the quantity will be far below the permissible limits. This may be attributed to relatively low pectin content of many fruits. For example: Kilbuck *et al.* (1951) found that methanol content of wines produced from enzyme treated grapes, especially when the whole fruits with the skin are used, increased to a little extent but was well within the legal limit of 0.35 per cent. Similarly Cruess *et al.* (1953) found that the methanol content of wine made from the Zinfandel grapes with the skin treated with enzyme was between 0.021 to 0.026 per cent whereas in the control it was 0.019 per cent. In

the case of *Muscat* grapes fermented on the skin, the values were 0.093 per cent and 0.108 per cent for the control and enzyme treated products, respectively. When expressed juice was fermented the figures were 0.076 per cent and 0.079 per cent respectively. These authors are of the opinion that for both juices and wines, the effect of pectic enzyme is slight and well within the permissible limit for methanol content.

Other exceptional uses of pectinases in fruit processing are: in the manufacture of better quality purees from prunes, peaches, apricots, strawberries, raspberries, black currants and other fruits. The enzymic process makes use of enzymes to soften skins and tissues.

Fruit purees are useful in preparing other products such as sharbaths, squashes, etc. The process described by Blackmore (1962) consists of grinding washed fruits, heating it to 145°F to effect pasteurization and then adding pectinase after the temperature is brought down to optimum range. After sufficient time the pulp is passed through a fine sieve and the resulting puree is frozen or heat processed in cans.

Pectinolytic enzymes are also used in canning of orange segments (Anon., 1968). In the customary procedure, sodium hydroxide solution is used in deskinning of the segments. This causes considerable loss of soluble solids and the percentage of broken segments is also high. When pectinolytic enzymes are used deskinning is completed within 90 to 120 minutes.

Ishi and Yokotsuka (1972) have successfully used pectin transeliminase produced from *Aspergillus japonicus* and *A. niger* for the clarification of apple and grape juices. The quantity of enzyme required for the clarification of grape juice is five times that for apple juice as pectin transeliminase is most active on highly esterified pectin as that of apple pectin.

Pectic enzymes are also used widely for disintegration of plant tissues in vegetables

and fruits (Wieland, 1972). Since a long time, attempts have been made to extract the juice under pressure or in a continuous screw press, or a centrifugal extractor. Little success has been achieved since the vegetable pulps have a marked tendency to clog the equipment. Calmer (1963) has patented a process for the extraction of juice from vegetables and fruits by using pectic enzymes.

Miscellaneous Applications

(a) One of the most important roles played by pectin degrading enzymes is in the retting of textile fibres from flax (*Linum usitatissimum*), hemp (*Cannabis sativa*), jute (*Corchorus* sp), *Hibiscus cannabinus* and *Malactia sapitata*. Process of retting is an age old practice and it is only recently that the role of microorganisms in retting has been studied in detail. The microorganisms associated with retting secrete pectinolytic enzymes which attack pectin in the middle lamella of the stem and release the fibres. There is not much technological improvement in the age old practice of retting. Both anaerobic and aerobic processes exist, in the former process species of *Clostridium* are involved while in the latter case species of the genera *Bacillus* and *Pseudomonas* have been invariably found. Some fungi like *Cladosporium herbarum*, *Penicillium* sp., *Aspergillus* sp. and yeasts belonging to *Cryptococcus* and *Rhodotorula* also take part in retting.

Pectic enzymes are also important in degrading the mucilage during curing of coffee and cocoa.

(b) Production of Low Methoxy Pectins

Pectin esterase preparations have been utilised for the production of slow set and low methoxy pectins from citrus peels by the action of natural PE present in these fruits. These can also be prepared from fungal enzymes free from PG. Inactivation of PG is accomplished by treating the enzyme

source with urea (Smythe *et al.*, 1952). Low methoxy pectins form stable gels in the presence of calcium at lower sugar concentrations than those required for normal pectin jellies.

Low methoxy pectins are also prepared by utilizing natural citrus pectin methyl esterase (Leo and Taylor, 1962). The enzyme is extracted with water containing stabilizers and some salts. This enzyme solution is mixed with high methoxy pectin in the presence of chalk and calcium chloride at pH 6.0 and temperature of 40-90°C. After deesterification the low methoxy pectin is separated, washed and dried.

These slow set pectins are used to delay premature setting of jellies during processing with attendant rupturing of the gel in the preparation of foods (Dentzer, 1961). Low methoxy pectins have found use where jels are required at low sugar concentrations or relatively at high pH levels.

(c) Pectic enzymes are also used in recovering important organic products from plant material. Pectinase preparations free from amylases are helpful in the recovery of starch. Disruption of gels for the recovery of essential oils is also brought about by applying pectic enzymes. Yields of lemon and orange oil have been increased considerably by this process (Platt and Poston, 1962). It has also been reported that yield of fatty oils (olive oil) increases by treating the pulp with pectic enzymes (Laguina, 1954). Commercial cellulases often contain pectinase and hemicellulase activity (Toyama, 1969). These preparations have been used for the production of unicellular vegetables, beans, potatoes and fruits. This preparation is also helpful in the removal of seed coat, extraction of green leaf components and for the modification of plant tissues.

(d) Pectic enzymes have been useful in the production of mono-, di-, tri- and oligouronides. As early as 1943, Rietz and

Maclay had standardized a procedure for the manufacture of D-galacturonic acids, which was required for medicinal purposes. Phaff and Luh (1952) have prepared pure di- and trigalacturonic acids, and Demain and Phaff (1954) isolated tetragalacturonic acids from pectic acid digest by yeast polygalacturonase. Altermatt and Deuel (1952a, 1952b) have produced these uronides by using fungal enzymes. Brooks and Reid (1955) have described methods for quantitative separation of these uronides by ion-exchange columns. Brooks and Reid (1955) have also developed a method of producing pure mono-, di- and trigalacturonic acids from crude enzyme hydrolysis of pectic acid. Pectic enzymes have been suggested for the production of galacturonic acid as a raw material for the synthesis of ascorbic acid (Reid, 1950).

(e) Another important application of pectinases is in research for analytical purposes, for the disintegration of cell wall and to release plant cells used in tissue culture. They are also useful for intact isolation of certain delicate structures from the plant tissues. Hohl (1948) has utilized fungal pectinase for the isolation of scleroids from a number of plants. Wood *et al.* (1952) were able to detach plant cuticle and isolate individual plant cells by using bacterial endo polymethyl galacturonase. Plant cuticles have also been isolated by Orgell (1955) by using fungal and yeast polygalactinonases. Demain and Phaff (1957) have also reported that sections of carrot were macerated by pectic enzymes. Roelofsen (1953) demonstrated a macerating action on *Lamium album* sections by crude culture liquid of *Saccharomyces fragalis*.

(f) One of the latest developments in the application of pectic enzymes is in the treatment of wood for preservation (Ward and Fogarty, 1972a, b). Commercial soft woods like Sitker and Norway spruce are treated with enzyme preparations or specific

bacteria which produce these enzymes. When this timber is properly preserved they can be used for a wide range of purposes. Freshly cut trees are resistant to treatment with preservatives even when high pressure is applied. The process developed by Dublin workers consists of storing the wood in a fresh water lake during which period pectinolytic microorganisms develop and make the wood permeable to preservative treatment. Enzymic destruction of pectin-containing tori and bordered pit membranes in the sap wood during the period of water storage is thought to be responsible for these effects.

So far we have been discussing the advantages of pectinolytic enzymes. However, there are some processes where these enzymes cause undesirable changes.

A great deal of investigations have been carried out and a large number of reports have been published on softening of cucumbers during pickling. This has been reviewed by Demain and Phaff (1956). The most likely cause of softening has been found to be due to fungi which are introduced *via* heavily contaminated flowers, necessary parts and cucumber themselves.

Certain spoilage moulds found on garlic, onions, black raspberries and strawberries, produce pectolytic enzymes which causes softening of tissues.

Breaking up in citrus fruit squashes is due to the innate pectinolytic enzymes found in the fruits. A major problem in frozen citrus concentrate industry is gelation and clearing of the concentrates, which are caused by pectin esterase of the juice. It has been shown that the PE content varies with the variety and kind of citrus fruit used and increased with the amount of pulp in the concentrate. When the juice is stored at 0°C or slightly above the activity of PE increases. Heating of the juice under carefully controlled conditions prior to concentration to inactivate PE solves the

problem to a great extent (Rouse and Atkins, 1953).

Conclusions

Enzymology has made steady progress since the last 50 years and its field of application has extended to every facet of modern biology. More than 1000 enzymes have been recorded and it is probable that many more exist in nature. Of these, only a few are being produced commercially and only a handful are used as food additives or in food processing. One of such important group is pectinolytic enzymes. Although many fruits contain innate enzymes capable of modifying pectin, application of commercial enzymes in vegetable and fruit processing started in the early thirties. Now, these enzymes are utilized for a variety of manufacturing processes, wherever the plant material is involved. An attempt has been made to bring out in this article, in a concise manner, the knowledge available on the pectin degrading enzymes and their usefulness to industry.

Fruit and vegetable processing factories constantly encounter difficulties in filtration and clarification of their products. Consumers of present day demand a fruit juice of good flavour, stability and sparkling clear. Pectic enzymes have to be used in processing to bring about the above mentioned qualities in fruit juice. Similar position exist in fermented beverage industry also.

Extraction of juice by simple pressing or by other mechanical means yields a raw juice of undesirable quality. Enzymic processing makes the juice not only clear by breaking down the pectin and allowing the suspended particles to settle down, but also eliminate undesirable changes in colour, bouquet and stability. Pectic enzymes are also helpful in other processes such as the manufacture of vegetable and fruit purees, production of low methoxy pectin etc. In

India some of the fruit processing units have resorted to enzymic processing while few others are contemplating adopting modern techniques. At present the entire requirement of pectic enzyme is met by imports except for a little quantity produced at certain institutions. As the area under vegetables and fruits is increasing rapidly, the demand for enzyme will also increase. The number of fruit processing factories and wineries will also increase with the increase in the production of horticultural commodities.

The foregoing pages indicate not only the importance of pectic enzymes in various manufacturing processes that are already existing in this country but also describe newer applications of this enzyme. In the light of these points, efforts directed towards establishment of enzyme units to meet the entire demand and adoption of latest technology will help to utilize the available raw material to the full extent and thus augment the country's food needs.

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PSORALENS IN FOODS

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Abstract

A survey has been carried out of the occurrence of psoralens and related furocoumarins presently known in plants. Their photosensitizing properties, repigmentation reactions in the skin, acute toxicities and chemotaxonomic significance are discussed. The possible contribution of these to melanogenesis in groups of human populations are indicated.

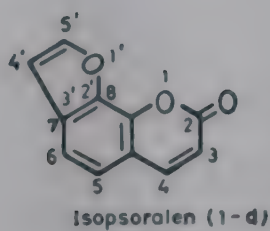
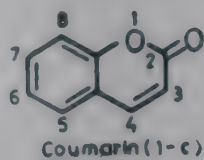
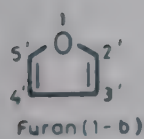
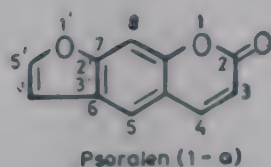
Introduction

Dietary constituents of natural origin are usually considered as sources of nutrients; proteins, caloric components and accessory growth factors. The trace constituents that have attracted attention are more often the flavour components that determine the consumer acceptability. The occurrence of pharmacologically active trace components has been reported in a few stray cases and the contribution of phenolic compounds to discolouration reactions has received some attention. The occurrence of furocoumarins in plants has been known and surveyed. Their contribution to melanogenesis has evoked special interest in their natural occurrence. Although skin pigmentation has been known to be determined by several factors, both genetic and environmental, the contribution of psoralens (Fig. 1) and related photosensitizing substances to natural skin colour of populations has not been precisely evaluated. It has been attempted to review information on the occurrence of these compounds in plant foods so that it will be possible to evaluate the part played by foods in determining skin pigments.

Photosensitizing effect of psoralens

Psoralen and related furocoumarins (Fig. 1) have been studied in detail because of their photosensitizing effects on animals when locally applied or orally consumed. It has been reported that bergapten (Fig. 1-2) produces a photosensitive dermatitis following application of perfumes containing it and xanthotoxin (Fig. 1-15) has produced vesicular dermatitis in fowls after consuming seeds of *Ammi majus*. Cases of dermatitis after skin exposure to celery and certain other juices and sun are believed to be due to this.¹ The photosensitizing effect of furocoumarins on mammalian cells², guinea pigs^{3, 4, 4a}, rabbits³, bacteria⁵ and animal viruses² have been reported. The relative degree of photosensitizing ability of natural and synthetic compounds and their manner of biological action have been studied by several workers^{1, 6-8, 8a}. Even though there is some disagreement as to the relative activity, it seems that psoralen (Fig. 1-a) is one of the most active compounds. As in the case of flavones⁹, psoralens appear to exhibit strong photodynamic action due to the entire specific ring system, and in particular, the 4'-5' double bond in the

Figure-1



1-1 Bergamottin	5-Geranoxy psoralen
1-2 Bergapten	5-Methoxy psoralen
1-3 Bergaptol	5-Hydroxy psoralen
1-4 Biacangelicin	8-(2,3-Dihydroxy-3-methyl butoxy)-4-methoxy psoralen
1-5 Imperatorin	8-(2'-Isopentenoxo)-psoralen
	8-Geranoxy psoralen
1-6 Isobergapten	5-Methoxy isopsoralen
1-7 Isoimperatorin	5-(2'-Isopentenoxo)-psoralen
1-8 Isooxypeucedanin	5-(3-Methyl-2-oxobutoxy)-psoralen
1-9 Isopimpinellin	5,8-Dimethoxy psoralen
1-10 Oxypeucedanin	5-(2,3-Epoxy-3-methyl butoxy)-psoralen
1-11 Peucedanin	6-Methoxy-7-isopropyl psoralen
1-12 Phellopterin	5-Methoxy-8-(2' isopentenoxo)-psoralen
	5-Geranoxy-8-Methoxy psoralen
	5-Isopentoxo-8-Methoxy psoralen
1-13 Pimpinellin	5,6-Dimethoxy isopsoralen
1-14 Sphondin	6-Methoxy isopsoralen
1-15 Xanthotoxin	8-Methoxy psoralen
1-16 Xanthotoxol	8-Hydroxy psoralen

furan ring (Fig. 1-b). These compounds have characteristic absorption maxima at 320 to 360 m μ with fluorescence emission at maxima of 420 to 460 m μ . It has been suggested that emission of this specific light in close proximity to some sensitive component may be important for activity¹⁰.

Psoralen in treatment of depigmentation

The two skin pigment disorders which induced many scientists to search for the remedies were (1) albinism, a congenital absence of pigment in the skin and its appendages and (2) vitiligo, an acquired leucoderma or appearance on the skin of white patches of greater or lesser extent due to simple loss of pigment without other trophic changes.

In treatment of leucoderma, a drug known as *Ammi majus* Linn. had been widely used in Egypt during the forties^{11, 12}. This drug was administered orally and the patients were exposed to sunlight. The most active compounds present in this drug which are responsible for considerable intensification of skin pigmentation are reported to be psoralen derivatives^{13, 14}. Of these, xanthotoxin (Fig. 1-15) has been characterized as an effective drug in treatment of vitiligo¹⁵. This compound not only enhances the tanning of the skin but protects it against injury by u.v. irradiation also¹⁶. The oil of *Psoralea corylifolia* fruit is yet another drug used as a tonic, as an aphrodisiac against impotency and menstruation disorders and externally against leucoderma, psoriasis and leprosy. It has a specific and tonic effect on skin. It is the only oil with effect on Rougets cells and melanocytes of the skin¹⁷. When such drugs are administered in vitiligenous patients, the pigmentless patches of their skin are to be necessarily coated with a solution of drug at a particular concentration for a certain length of time preceding irradiation with a quartz-Hg lamp or sunlight¹⁰. The minimum effective doses of u.v. irradiation required for intensification

of the sensitivity of the skin of animals both when locally applied to the skin and internally administered were reported to be 10 gamma/cm², 20 gamma/cm² and 40 gamma/cm² for xanthotoxin (Fig. 1-15), bergapten (Fig. 1-2) and imperatorin (Fig. 1-5) respectively³.

Studies on activities of oxidative enzymes involved in repigmentation reactions of the skin in cases of albinism and vitiligo have been reviewed by Herzberg.¹⁸ Based on electrophoretic studies of serum proteins in vitiliginous patients treated with oral psoralens and u.v. irradiation, it had been reported that the below normal level of serum α_2 -globulin could be quickly restored by such treatment¹⁹. The role of psoralen in causing mobilization of copper from the liver to blood and interactions between the pituitary, melanin formation and tyrosinase activity in patients with vitiligo has been reviewed by Biswas *et al*.⁶

Acute toxicity of psoralens

Even though oral administration of certain drugs such as *Ammi majus* Linn., *Psoralea corylifolia*, *Psoralea drupacea*, etc. have been reported to bring about repigmentation of white patches of vitiligo, according to Lerner *et al*¹², the former drug (*Ammi majus* Linn.) causes certain undesirable side effects such as severe vomiting, diarrhoea, coma, abdominal pain, rephritis, hepatitis, cirrhosis of the liver and exfoliative dermatitis. The toxic effects of psoralen, imperatorin and psoralen—isopsoralen mixture (1:1), employed in the treatment of leucoderma, have been investigated by Mukherji²⁰ employing albino rats as the experimental animals. Data on pharmacological preparation of psoralen extracted from *Psoralea drupacea*²¹ showed that LD₅₀ of psoralen for mice was 480 mg/kg hypodermically and 625 mg/kg internally in an oil suspension. Corresponding values were 830 and 1330 for rats. LD₁₀₀ for mice was 1250 mg/kg internally. Death

occurred at the end of the first or beginning of the second day with symptoms of increasing general paralysis. Hemodynamic and dystrophic alterations were found in internal organs, the heart and the brain. In rabbits, a single 25 mg of psoralen per kg injection caused hypoglycemia for 6-24 hours and more. The minimum lethal dose (M.L.D.) for xanthotoxin in case of mice²² and guinea pigs²³ have been reported as 300 mg/kg and 400 mg/kg respectively.

The biochemical studies on soil sickness have revealed that psoralens from fig roots inhibit the seedling growth of radishes²⁴ and the leachate of *Psoralea subacaulis* seeds inhibit seed germination and root growth of *P. subacaulis*, *Lactuca sativa*, *Lycopersicon esculentum*, *Raphanus sativus* and *Cucumis sativus*²⁵. Fungicidal properties²⁶ and fish poisoning²⁷ of natural furocoumarins have been reported.

Occurrence of psoralens in foods and their taxonomic significance

Psoralens are considered secondary substances, because they do not seem to be essential for life at least at the cellular level^{28,29}. This concept is useful in that it helps to explain why plants have been free to develop genetically controlled, chemotaxonomically significant, but highly variable qualitative and quantitative differences between families. With only a limited distribution, psoralens are characteristic of certain families, genera, species or even to certain varieties and can be considered as expressions of the biochemical individuality of these organisms³⁰. For example, examination of several species of *cachrys* had revealed that commonly present psoralen derivatives in all species were bergapten (Fig. 1-2), bergaptol (Fig. 1-3), imperatorin (Fig. 1-5), isoimperatorin (Fig. 1-7) and oxypeucedanin (Fig. 1-10)³¹.

Compared with the biogenetically related flavonoids, the furocoumarins in foods have

TABLE 1. Distribution of furocoumarins (psoralens) in plants

Family name	Botanical name	Compound	Structure	Reference	
Leguminosae	<i>Psoralea corylifolia</i>	Isopsoralen	(1-d)	38	
		Psoralen	(1-a)	38	
	<i>Psoralea drupacea</i>	Psoralen	(1-a)	39	
	<i>Psoralea macrostachya</i>	Isopsoralen	(1-d)	40	
	<i>Aeglopsis chevalieri</i>	Isopimpinellin	(1-9)	41	
	<i>Afraegle paniculata</i>	Xanthotoxin	(1-15)	42	
	<i>Citrus aurantifolia</i>	Bergamottin	(1-1)	30	
		Bergaptol	(1-3)	30	
		Imperatorin	(1-5)	30	
		Isoimperatorin	(1-7)	30	
		Isopimpinellin	(1-9)	30	
		Oxypeucedanin	(1-10)	30	
		Phellopterin	(1-12)	30	
	<i>Citrus limon</i>	Bergamottin	(1-1)	30	
		Bergaptol	(1-3)	30	
	Rutaceae		Biacangelicin	(1-4)	30
		Imperatorin	(1-5)	30	
		Isoimperatorin	(1-7)	30	
		Isopimpinellin	(1-9)	30	
		Oxypeucedanin	(1-10)	30	
		Phellopterin	(1-12)	30	
<i>Citrus monnieri</i>		Imperatorin	(1-5)	43	
<i>Cneoridium dumosum</i>		Bergapten	(1-2)	41	
<i>Dictamnus albus</i>		Bergapten	(1-2)	44	
<i>Poncirus trifoliata</i>		Imperatorin	(1-5)	43	
		Xanthotoxol	(1-16)	41	
<i>Ruta graveolens</i>		Psoralen	(1-a)	45	
<i>Ruta pinnata</i>		Bergapten	(1-2)	46, 47	
		Xanthotoxin	(1-15)	46	
Umbelliferae		<i>Ammi majus</i>	Bergapten	(1-2)	48
			Isopimpinellin	(1-9)	49
		Xanthotoxin	(1-15)	48	

Family name	Botanical name	Compound	Structure	Reference
Umbelliferae (contd.)		Xanthotoxol	(1-16)	49
	<i>Angelica anemola</i>	Bergapten	(1-2)	50
		Imperatorin	(1-5)	50
		Imperatorin	(1-5)	50
	<i>Angelica archangelica</i>	Bergapten	(1-2)	51
		Isopimpinellin	(1-9)	52
		Xanthotoxol	(1-16)	52
	<i>Angelica dahuria</i>	Biacangelicin	(1-4)	50
		Imperatorin	(1-5)	50
		Imperatorin	(1-5)	50
	<i>Angelica formosona</i>	Bergapten	(1-2)	50
		Imperatorin	(1-5)	50
		Imperatorin	(1-5)	53
	<i>Angelica genuflexa</i>	Imperatorin	(1-5)	53
	<i>Angelica keiskei</i>	Bergapten	(1-2)	54
		Isopsoralen	(1-d)	54
		Psoralen	(1-a)	54
		Xanthotoxin	(1-15)	54
	<i>Angelica pubescens</i>	Bergapten	(1-2)	55
	<i>Angelica sylvestris</i>	Isoimperatorin	(1-7)	56
		Isooxyypeucedanin	(1-8)	57
		Psoralen	(1-a)	56
	<i>Angelica saxicola</i>	Isopsoralen	(1-d)	58
	<i>Angelica ubatakensis</i>	Isopsoralen	(1-d)	59
	<i>Archangelica dacurens</i>	Imperatorin	(1-5)	60
		Isoimperatorin	(1-7)	60
		Biacangelicin	(1-4)	61
	<i>Archangelica tschimganica</i>	Biacangelicin	(1-4)	61
	<i>Bupleurem falcatum</i>	Isopsoralen	(1-d)	59
	<i>Cnidium monnieri</i>	Imperatorin	(1-5)	62
		Isopimpinellin	(1-9)	62
		Xanthotoxol	(1-16)	62
	<i>Heracleum candicans</i>	Bergapten	(1-2)	63
		Imperatorin	(1-5)	64
		Imperatorin	(1-5)	64
	<i>Heracleum cyclocarpum</i>	Bergapten	(1-2)	65
		Isopimpinellin	(1-9)	65
		Isopsoralen	(1-d)	65

Family name	Botanical name	Compound	Structure	Reference
Umbelliferae (contd.)	<i>Heracleum dissectum</i>	Pimpinellin	(1-13)	65
		Sphondin	(1-14)	65
		Xanthotoxin	(1-15)	65
		Bergapten	(1-2)	66
		Isopimpinellin	(1-9)	67
		Isopsoralen	(1-d)	67
		Pimpinellin	(1-13)	67
		Sphondin	(1-14)	66
		Xanthotoxin	(1-15)	66
	<i>Heracleum lanatum</i>	Bergapten	(1-2)	68
		Isopimpinellin	(1-9)	68
		Pimpinellin	(1-13)	68
		Sphondin	(1-14)	68
	<i>Heracleum mante-gassicanum</i>	Bergapten	(1-2)	52
		Isopimpinellin	(1-9)	52
		Xanthotoxol	(1-16)	52
	<i>Heracleum mante-gazzianum</i>	Bergapten	(1-2)	66
		Isopimpinellin	(1-9)	66
		Pimpinellin	(1-13)	69
		Sphondin	(1-14)	66
		Xanthotoxol	(1-15)	66
	<i>Heracleum sibiricum</i>	Isopimpinellin	(1-9)	70
		Sphondin	(1-14)	70
	<i>Heracleum sosnowskyi</i>	Bergapten	(1-2)	71
		Isopimpinellin	(1-9)	71
		Isopsoralen	(1-d)	71
		Pimpinellin	(1-13)	72
		Sphondin	(1-14)	71
		Xanthotoxin	(1-15)	71
		Isopimpinellin	(1-9)	73
	<i>Heracleum sphondylium</i>	Pimpinellin	(1-13)	26
		Sphondin	(1-14)	73
		Isopimpinellin	(1-9)	70

Family name	Botanical name	Compound	Structure	Reference
Umbelliferae (contd.)		Isopsoralen	(1-d)	70
		Sphondin	(1-14)	70
	<i>Hippomarathrum caspium</i>	Xanthotoxin	(1-15)	74
	<i>Hippomarathrum microcarpum</i>	Imperatorin	(1-5)	75
		Isoimperatorin	(1-7)	76
		Isopimpinellin	(1-9)	76
		Xanthotoxin	(1-15)	76
	<i>Pastinaca opaca</i>	Bergapten	(1-2)	77
		Isopimpinellin	(1-9)	77
		Xanthotoxin	(1-15)	77
		Peucedanin	(1-11)	78
	<i>Peucedanum calcareum</i>	Peucedanin	(1-11)	79
	<i>Peucedanum morisoni</i>	Isoimperatorin	(1-7)	35
	<i>Peucedanum palustre</i>	Isooxypeucedanin	(1-8)	35
		Peucedanin	(1-11)	54
	<i>Peucedanum ruthenicum</i>	Peucedanin	(1-11)	78
	<i>Peucedanum tauricum</i>	Bergapten	(1-2)	80
	<i>Phellopterus littoralis</i>	Imperatorin	(1-5)	80
		Bergapten	(1-2)	81
	<i>Pimpinella heyeana</i>	Isopimpinellin	(1-9)	82
	<i>Pimpinella magna</i>	Pimpinellin	(1-13)	73
		Sphondin	(1-14)	73
		Pimpinellin	(1-13)	73
		Sphondin	(1-14)	73
	<i>Pimpinella saxifraga</i>	Imperatorin	(1-5)	83
		Xanthotoxin	(1-15)	84
		Xanthotoxol	(1-16)	85
	<i>Prangos ferulacea</i>	Isoimperatorin	(1-7)	86
	<i>Prangos isophariamica</i>	Isoimperatorin	(1-7)	87
	<i>Prangos ornata</i>	Imperatorin	(1-5)	88
		Isoimperatorin	(1-7)	88
	<i>Prangos pabularia</i>	Bergapten	(1-2)	89, 90
		Imperatorin	(1-5)	89
		Isoimperatorin	(1-7)	89
		Peucedanin	(1-11)	89
	<i>Prangos seravschanica</i>	Imperatorin	(1-5)	91

received little attention from food chemists, despite their important pharmacological properties¹. Their general occurrence have been reported in several plant families, notably Umbelliferae,³²⁻³⁵ Rutaceae,³⁸ Leguminosae,³³ and Moraceae³⁶. These furocoumarins are present in the peel, juice and oil sacs of citrus fruits and can be isolated from cold-pressed citrus oils, but the amounts are small³⁰. An elegant technique for the extraction and examination of citrus coumarins was reported by Peyron³⁷ who made direct chromatographic studies on the fluid removed from the oil sacs of the fruit with a micro-syringe.

The present knowledge of the identity and the distribution of furocoumarins in plants is summarized in Table 1. This subject has been briefly reviewed by many authors^{32, 92-97}. The citrus fruit, richest in furocoumarin derivatives, is the lime, in the oil of which Cieri⁹⁸ found bergamottin (Fig. 1-1) (2.2-2.5 per cent) and bergapten (Fig. 1-2) (0.17-0.33 per cent) with traces of bergaptol (Fig. 1-3) and isopimpinellin (Fig. 1-9). Whereas imperatorin (Fig. 1-5), isopimpinellin (Fig. 1-9), oxypeucedanin (Fig. 1-10) and phellopterin (Fig. 1-12) are apparently present only in lemon and limes, those which are common to several citrus species are bergaptol (Fig. 1-3), isoimperatorin (Fig. 1-7), bergamottin (Fig. 1-1) and biacangelicin (Fig. 1-4)⁹⁹.

A wide variety of foods may contain compounds which are melanogenic. No single food (product) is likely to contain dermatologically active compounds in sufficient concentrations to exert a physiological effect. The normal intake level of psoralen varies significantly with the diet, but may be larger than is normally required if one prefers some foods which contain considerable quantity of psoralens. Several foods¹⁰⁰, spices in particular, are reported to contain some known furocoumarin derivatives as normal components. In this context, recommenda-

tion of such foods in the diet of vitiliginous patients may be considered as a strong proposition.

The wide distribution of psoralen group of compounds in temperate plants has been surveyed. No such exhaustive study has as yet been carried out on tropical plants. The present survey brings out the fact that plants belonging to the family Umbelliferae and Leguminosae are notably rich in psoralens, to the former belong several common spices. It is tempting to postulate the role of these psoralen-rich foods in determining the skin complexion of the tropical man, although the importance of genetic and environmental factors in this respect cannot be disputed. Even though the psoralens are so ubiquitous, the dietaries of the tropical populations are predominantly of vegetable matter, richer in legumes and spices. It would be worth surveying the quantitative intake of the psoralen group of compounds by the various population groups. Perhaps this higher intake of the photosensitizing compounds with the exposure to direct sunlight for extended periods may be responsible, in some measure at least, for the melanogenic response. There is a wide lacuna in our knowledge as to the distribution of the active compounds in the edible portions, as to their stability to various processing operations and hence, how much of the original material is ultimately ingested by the consumer. A detailed study on these lines is necessary before concrete conclusions can be derived.

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VEGETABLE PROTEIN FOR COMBATING PROTEIN MALNUTRITION IN DEVELOPING COUNTRIES*

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Abstract

In India and other developing countries, the state governments have launched programmes of nutritional intervention in the case of vulnerable groups of population. Since milk is in short supply, necessarily these programmes are dependent on oil seed protein concentrates. In India, edible peanut flour is used in such programmes. The foods based on this which are now used are Bal Ahar and Miltone. Bal Ahar is a dry blend of flours from cereals, oil seed meals and pulses. Several such compositions are used in those programmes. Miltone which is a milk like preparation containing peanut protein isolate is being produced at the Bangalore Dairy for the Special Nutrition Programme for children below 6 years. The paper describes the chemical composition and nutritive value of these foods. Details of the programme and the use of Miltone are described.

The magnitude of malnutrition amongst the population in the developing countries has been conservatively estimated to be about 10 per cent (Sukhatme, 1967). The pre-school and school children are the major sufferers. Malnourishment is linked with the economic status of population. The calorie intake as well as the intake of proteins and vitamins tend to go down with the income of the family. Recent published data in India has shown that between 20 to 40 per cent of the people do not have a *per capita* consumption level of more than Rs 40 (\$5) per month and hence have been classified as below the 'poverty line' (Anonymous, 1973). In India, the animal protein is only 10 per cent of the total protein in the diet (55 g). The consumption of animal

protein (milk, meat and eggs) is also linked with the income (Anonymous, 1972).

Several reasons have been put forward for the cause of malnutrition in the developing countries. But overall it is the problem of over population and under production. The reasons for under production in a country, which is predominantly agricultural like India, have been discussed by Swaminathan (1973). These are: (1) the low yields of crops as compared even to the minimum yields of similar crops elsewhere, (2) the large percentage of population involved in the production of food (72 per cent) and (3) the dependence of agriculture on monsoons which are highly unpredictable. The nutritional content of the meals and the overall incidence of malnutrition is a con-

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sequence of this agricultural situation. The calorie and protein content of the average Indian meal in 1940 was 1950 and 52.2 g and in 1969 it was 2450 and 48 g. In the same period the calorie and the protein contents of the meals in Japan showed an increase from 2020 and 60 g to 2450 and 75 g; this improvement in the nutrition value of the Japanese diet has resulted in marked improvement of the health of the younger generation.

The effect of malnutrition of the young population (42 per cent of the total Indian population is below 14 years) on the economics and future welfare of the state has attracted considerable attention in India and in other developing countries (Muscat and Berg, 1971). The Task Force on Nutrition of the National Committee for Science and Technology appointed by the Government of India has brought this out in its recommendations and has emphasised the need for an overall effort to remedy this. The cost of malnutrition of the growing population to the state is made up of several components like (a) providing sustenance and maintenance to a large number of malnourished and possibly mentally retarded individuals and the effect of this on the well-being of the state, (b) the cost of treatment, hospitalisation and rehabilitation of the malnourished and (c) overall loss of the investment in the death of the malnourished. In countries like India where a large section of the juvenile population is under or malnourished, the cost of such avoidable losses could be enormous. Realising this and with the object of overcoming the national waste, the Government of India has launched massive welfare programmes for nutritional intervention of the vulnerable groups.

Nutritional Programmes

These programmes could broadly be divided into (a) programmes which are concerned with the feeding of the school going child, (b) programmes which are specially

concerned with the feeding of the preschool children, infants, the lactating mothers and pregnant women, (c) programmes which are directed towards the amelioration of malnourishment amongst the children of the tribal people and (d) programmes which are composite in nature and which involve education or family planning approach along with nutrition. Most of these programmes are based on provision of food which is locally available. In India, the production of adequate milk has many constraints. Though India happens to be third in the production of milk in the world, still the amount of *per capita* availability of milk is extremely small (110 ml). Government projects, which are trying to augment the milk productions, are multipronged in approach. They aim at (1) better utilization of land to produce cattle fodder, (2) improvement of the breed by cross fertilization and artificial insemination, (3) better provision of roads and other facilities to the villages, which are the main milk producing centres and (4) better utilization of the milk by proper collection, processing and distribution. In spite of the great emphasis that has been placed on these measures, the overall production of milk is still lagging and cannot catch up with the increasing population. Milk is available only in limited quantities at a price which often is beyond the purchasing capacity of a large section of the population. Imported milk powder was being used in the nutritional programmes but the dwindling stocks of milk powder in the producing countries and the increase in cost has made this unavailable now. Use of locally produced milk or milk powder in these nutritional intervention programmes is thus not possible.

Edible oil seed flours for foods for the vulnerable groups

An alternative source to milk protein in India is protein from edible oil seed meals. Oil seed meals are comparatively

cheap, as they are the by-products of the oil industry. A kilo of protein from milk costs about \$7 while from imported skim milk powder it costs \$5. But protein from peanut flour costs only \$0.53. This as a source of cheap protein, edible oil seed meals are very attractive. Besides use of edible oil seed used as human food is a shorter food chain than use of it as food for cattle, for production of protein in milk or meat. The available source of oil seed meals in India are shown in Table 1. The most abundant sources are peanut flour and cotton seed flour. The cultivation of soya was started on a large scale only recently, and the quantity available for use as food supplements is limited.

The problem in the utilization of oil seed flours in human foods are (a) production of the flours in a sanitary and hygienic way, (b) elimination of toxic constituents present in them and (c) enhancing the low nutritional value of the flours.

TABLE 1. Production of major oil seeds and legumes in India and their potential protein supply during 1971 (FAO Production Year Book 1972)

Oil seeds and legumes	Area × 1,000 ha.	Average yield 100 kg/ha.	Production × 1,000 MT	Protein equivalent × 1,000 MT
Cotton*	7,610	2.2	1,641	328
Groundnut kernel	6,900	6.3	4,250	1,088
Sesame	2,500	1.8	460	92
Rapeseed	3,321	5.9	196	36
Copra	...	...	280	21
Chick pea	7,810	6.7	5,247	1,049
Pigeon pea	2,648	7.0	1,854	371
Total				2,985

* The data is for 1970

Standards have been laid down for edible oil seed flours from peanut (Dc. 1971; ISI, 1968), cotton seed and soya (PAG, 1965; ISI, 1969). The method for the production of the flour from peanut has been standardized by the Central Food Technological Research Institute (Subrahmanyam *et al.*, 1957 a.). The peanut flour produced according to the above method is free from the red cuticle and the germ. A process for the production of edible sesame flour has also been standardized by Shamanthaka Sastri *et al.* (1969) and standards for it prescribed (PAG 1973).

The antinutritional and toxic factors in the oil seed meals are well recognized and characterised (Liener, 1969). Methods for removal or for bringing them below toxic levels have been published. In peanut meal, the level of the adventitious toxin, aflatoxin, can be controlled in several ways. According to the Mysore method (Subrahmanyam *et al.*, 1957) the toxin is controlled by carefully picking out the fungus affected seeds twice before expelling for oil. Methods for complete removal of the toxin by chemical methods have also been published (Srinivasamurthy *et al.* and Gardener *et al.*, 1971). In India, peanut protein concentrate is mostly used in child feeding programmes. Edible cotton seed meal is not used because it is relatively costly. There are at present no large scale units for production of gossypol-free cotton seed flour in the country. Moreover the colour of cooked cotton seed flour is not acceptable. Soya flour has been recently introduced and as yet large quantities are not available for these programmes. However, the CARE organisation is importing soya flour and using it in its programmes. Sesame flour is still in the development stage.

The amino acid composition of the edible flours is shown in Table 2. By themselves the oil seed meals are low in nutritive value

TABLE 2. Amino acid composition of the proteins of principle oil seed meals, legumes and milk

Sl. No.	Name of material	% Protein in seed or milk	Isoleucine	Leucine	Amino acid composition (g per 100 g protein)					
					Lysine	Total amino acids	Phenyl-alanine	Threonine	Tryptophan	Valine
1.	Groundnut	25.6	3.38	6.40	3.53	2.40	4.98	2.61	1.04	4.18
2.	Soya bean	38.0	4.54	7.78	6.38	2.59	4.94	3.35	1.28	4.80
3.	Sunflower seed	12.6	4.37	6.42	3.60	3.39	4.45	3.68	1.36	5.07
4.	Sesame	18.1	3.61	4.70	2.74	4.62	4.43	3.57	...	4.61
5.	Cotton seed	20.2	3.30	5.92	4.42	2.85	5.22	3.30	1.25	4.64
6.	Niger seed	17.3	4.21	6.56	4.43	3.18	4.26	3.87	...	3.63
7.	Bengal gram	20.1	4.43	7.49	6.85	2.22	5.73	3.76	...	4.54
8.	Milk (Cow)	3.5	4.72	9.53	7.79	3.33	5.38	4.45	...	5.79

(PER) but when supplemented with each other or with a good protein like milk, their PER can be raised to that of casein or even of milk. This principle is used in the formulation of the foods for the Welfare Programme.

Foods used in Nutritional Intervention Programmes

The new foods that are being used in the nutritional intervention programmes in India can be classed into three categories: (1) high protein foods, (2) medium protein foods and (3) milk like preparations. A high protein food under the name of Indian Multipurpose Food was used in school feeding programmes as a supplement to the staple food (Subrahmanyam *et al.*, 1957b). This was a blend of 75 parts of edible peanut flour and 25 parts of chick pea flour (*Cicer arietinum*). It was fortified with vitamin A, vitamin D, Thiamine, Riboflavin and Nicotinic acid and with calcium phosphate. Studies have shown its beneficial effect in post-Kwashiorkar treatment

as well as in preventive treatment of malnutrition (Subrahmanyam *et al.*, 1957 b). Though the benefits of its use in these cases has been well established and its price is comparatively low (about \$0.50 per Kg) it is now used only in a restricted quantity and only one unit is producing this. The reasons for its limited success are (a) it was not backed by marketing strategy and (b) private sector units were reluctant to produce it, as the profit margin was narrow (Orr, 1972).

Bal Ahar: The most widely used food at present in these programmes is 'Bal Ahar'. This name is a generic term meaning children's food. Under this caption, several formulae have been tested and used. The one that was originally in production was a blend of seventy parts of whole wheat flour (*atta*), fifteen parts chick pea flour and fifteen parts peanut flour. On considerations of cost the chick pea flour was substituted by soya flour. The food is fortified with vitamins and calcium phosphate. The chemical composition and amino acid composition of the blends are shown in Table 3 (The CARE organization

TABLE 3. *Composition of foods used in the nutrition programmes in India*

Constituent	Bal Ahar						Energy Food	Win Food	KIF
	For- mula I	For- mula II	For- mula III	For- mula IV	For- mula V				
Wheat	—	70	—	70	—		15	—	—
Bulgar wheat (soy fortified)	85	—	85	—	95		—	—	50
Bajra*	—	—	—	—	—		—	40	—
Ragi†	—	—	—	—	—		22	—	—
Tapioca flour	—	—	—	—	—		—	—	25
Edible peanut flour	15	30	—	15	—		15	25	25
Soya flour (defatted)	—	—	—	15	—		—	—	—
Chick pea flour	—	—	15	—	5		15	15	—
						Green gram flour§			
						Brown sugar	23	20	—
						Hydrogenated fat	5	—	—
						Salts	5	—	—
Protein content	22	23	18	22	18		17	20	21
Energy content (kilo calories)	359	357	357	359	355		432	332	359
<i>Amino acids g/16g nitrogen calculated</i>									
Lycine	4.0	3.3	4.6	4.0	4.4		4.0	4.0	3.8
Total S amino acids	3.0	3.0	3.1	3.2	3.2		2.9	2.7	2.8
Threonine	3.2	2.7	3.6	3.2	3.5		3.0	3.0	3.0

* Pennisetum typhoideum. † Eleusine coracana. § Phaseolus aureus. † Cicer arietinum.

in India is supplying CSM which is a blend of 85 parts of fortified soya flour and 15 parts of solvent extracted soya). Bal Ahar is being produced by several flour millers in the country for the Government. During 1972-73, 25,000 tonnes of Bal Ahar were produced and it is projected that during 1974, the production will be 40,000 tonnes. Recently attempts are being made to replace the imported content in Bal Ahar (the bulgar wheat and soya) by indigenously available raw materials. A blend under the name of Energy Food has been standardized and is

under trial in a block at Chitradurga (Karnataka State) where nutrition is being combined with family planning. A similar attempt is the production of Win Food in Tamil Nadu and KIF in Kerala. The composition of these are shown in Table 3.

Extruded foods are also being tried. An experiment to assess the acceptability of extruded Bal Ahar with soya bean oil sprayed on it is being tested by the Amul organization (the foremost baby food manufacturers in India) in a village near Surat (Gujarat State). Similarly the CARE orga-

plantation has set up a unit in Andhra Pradesh State for the production of ready-to-eat foods in the form of fried macaroni.

TABLE 4. Chemical composition of *Miltone*

Constituent	Values per 100 g
Total solids	11.5 g
Fat	2.6 g
Protein	4.2 g
Carbohydrates	3.7 g
Vitamin A	150 I.U.
Vitamin C	0.8 mg
Vitamin D	75 I.U.
Vitamin E	0.3 mg
Thiamine	0.24 mg
Riboflavin	0.15 mg
Pantoic acid	0.05 mg
Niacinamide	0.10 mg
Calcium pantothenate	0.25 mg
Vitamin B ₁₂	0.27 mg
Folic acid	0.20 mg

Miltone—Milk like preparations based on oil seed meals were first prepared by Subrahmanyam *et al.* (Anonymous, 1955). In these early preparations either peanut or soya were used as such. The resulting milk always had a characteristic smell of soya or peanut from which it was not. Hence marketing of these was difficult. In the modified process of preparation of *Miltone* (Chandrasekhara *et al.*, 1971) protein is isolated from solvent extracted edible peanut flour. To enhance the nutritive value and its organoleptic acceptability it is mixed with an equal quantity of milk. The composition is shown in tables 4 and 5. *Miltone* has nearly the same physical and chemical characteristics of milk. Its protein is a blend of equal parts of peanut protein and milk protein, 50 per cent of

TABLE 5. Amino acid composition of *Miltone* and *Miltone* curd

Amino acid	g per 10 g Nitrogen			
	<i>Miltone</i>	<i>Miltone</i> Curd	FAO Pattern	Egg Protein
Lysine	4.2	4.4	4.2	7.0
Methionine	1.9	2.3	2.2	3.4
Total S amino acids	3.3	3.5	4.2	5.8
Phenylalanine	5.4	4.0	2.3	5.7
Leucine	4.2	4.5	4.8	8.8
Isoleucine	4.8	4.8	4.8	6.2
Valine	6.1	6.0	4.2	6.8
Arginine	10.2	9.0	—	—
Threonine	3.6	3.4	2.3	5.1
Tryptophan	1.3	1.2	1.4	—
Available lysine	2.6	4.2	—	—
Chemical (Egg protein) score	57 (TSA)*	57 (TSA)*	—	—
Chemical (FAO Pattern)	78	78	—	—

* On the basis of Total Sulphur Amino Acids

+ Amino Acid Content of Foods, 1970, FAO, Rome

TABLE 6. Protein efficiency ratio of Miltone, sterilized Miltone and Miltone curds

Treatment	Average initial weight	Average gain in weight	Average protein consumed	Average PER	Standard PER
Miltone as such	32.5	22.0	60.1	2.7	2.5±.046*
Miltone sterilized	32.5	19.9	51.8	2.6	2.3
Miltone lactic fermented	32.6	23.9†	72.0†	3.0	2.7±.05*
Control milk	32.7	28.3	93.8	3.3	3.0±.046*

* Standard error on 27 degrees of freedom.

† Average based on 7 observations only. Test of significance A-B 0.14 (5%) B-C 0.43 (0.1%). All three treatments significantly (0.001) lower than control).

TABLE 7. Infant feeding trial with Miltone and control toned milk

Group	Supplement given	No. of infants	Weight kg			Height cm		
			Average initial	Average final	Average increase ±SE	Average initial	Average final	Average increase ±SE
A	Miltone	22	6.0	7.2	1.2±0.1	65.8	70.2	4.4±0.1
B	Toned milk	19	5.8	7.2	1.4±0.1	64.6	69.2	4.7±0.1

Difference and results of significance 0.2 N.S.

0.3 N.S.

N.S.=Not Significance (P 0.05)

Results of test of significance based on two tailed test and standard errors are calculated from the pooled variance based on 39 degrees of freedom.

carbohydrate is sucrose. The fat which is entirely from milk is only 50 per cent of what was in the milk used. Feeding trials have been conducted on Miltone and spray dried preparations resembling Miltone (Chandrasekhara *et al.*, 1972). These are summarized in tables 6 and 7. The feeding trials have shown that Miltone compares well with milk in providing nutrition to the growing children. Miltone has been in production for the past seven years at the Bangalore Dairy. From a production of about 400 litres of Miltone per day the production has gone upto the present day production of 6,000 litres per day

The entire quantity is now being used in the Special Nutrition Programmes in urban slum area of Bangalore.

Miltone is well adapted to this programme because of the following reasons: (a) it doubles the quantity of milk available for these programmes without using scantily available imported skim milk powder, (b) the cost of Miltone is much less than of milk (the selling price at Bangalore of one litre of milk with SNF 9.8 and Fat 3.8 is \$0.21 and of Miltone with SNF 9.0 and Fat 1.9 is \$0.14), (c) it has a high acceptability with children and (d) it is well suited for providing nutrition to the infants who cannot take

TABLE 8. Special nutrition programme:
Supplementary feeding regimen for different
age groups

Age (months)	Food supplement
0-6	225 g Miltone.
7-12	225 g Miltone and one slice (35 g) bread.
13-36	225 g Miltone and three slices (100 g) bread.
37-72	84 g Miltone and two slices (66 g) bread.
Pregnant women (Last three months)	84 g Miltone and three slices (100 g) bread.
Lactating mothers (first quarter)	

only bread. However, since only Miltone cannot provide the calories required, it is given along with bread. The ration is shown in Table 8.

The success of utilization of Miltone in this programme at Bangalore has encouraged the Government to set up two more such units (Production capacity 5000 litres per day) at Hyderabad and at Ernakulam. These units will go into production during September of this year. It is proposed to set up four more such units during the current year.

A large unit with a capacity of 24,000 litres of Miltone per day is being set up at the Bangalore Dairy. This unit will require automatic centrifuges and decanters which are not being made in India at present. UNICEF has been a partner in these projects since the time they were conceived and is now purchasing these non-indigenous equipment for the plant. It is expected that this plant will be in operation by the end of 1975.

Miltone can also be sterilized to provide a beverage. For this, Miltone is generally flavoured and used. This is filled in 200 ml capacity bottles which are crown corked and

sterilized at 15 psi for about 15 minutes in a revolving steam sterilizer. The shelf-life of this product is more than six months even at ambient temperatures. It has found excellent acceptance among school children. One bottle of sterilized Miltone provides 8 g protein and about 110 kilo calories besides vitamins and minerals.

In the nutritional intervention programmes of the Indian Government to improve the health of the preschool and school children, oil seed meals offer an excellent medium. Processed products based on these like Bal Ahar and Miltone provide acceptable foods for such programmes.

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LIVESTOCK MARKET AND MARKETING OF LIVESTOCK

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The *modus operandi* of Livestock Market and Marketing of Livestock meant for slaughter is the same throughout India. There are fixed days for holding the market, which differ depending upon the requirement of a particular area, species of animals, local conditions, and prevailing customs.

In cities, the marketing is done more than once a week, and the livestock brought for sale and slaughter is large due to more daily consumption of meat.

Sale and purchase of livestock take place at producing centres in rural areas and in the terminal markets at consumer point. There are meeting places enroute where animals from different producing areas are gathered, almost daily for transshipment, sale and purchase, between the merchants or supplying agents. Usually transaction is wholesale. At times retail is also witnessed at Sabarmati, Surat, Baroda, Ajmer, Jodhpur, Delhi, Palanpur, Disa, Meerut, Agra, Indore, Ratlam, Babarpur, and Urai. The contractors take advantage to buy good, selected animals for supply to Military Butcheries at Delhi, Patiala, Chandigarh, Ludhiana, Ferozpur, Pathankot, Jammu, Simla, Nainital, Siligola, Tundla, Meerut, Amritsar, Jodhpur, and Shrinagar.

Rajasthan is the main producing centre of livestock i.e. sheep and goats. The production rate is as follows:

State	Sheep	Goat
(1) Rajasthan	75%	25%
(2) Gujarat	50%	50%
(3) Uttar Pradesh	80%	20%
(4) Madhya Pradesh	20%	80%
(5) Maharashtra	25%	75%

The variation of percentage of the sheep and goats depends upon the species, conditions favourable for the husbandry, climatic and seasonal variations.

Of the total output of the livestock in the country, Rajasthan produces more than 60 per cent. The remaining 40 per cent comes from all other states. On account of vastness of the area spread over different geographical and economical conditions, the breeding and production of the livestock and operating seasons for marketing are different for every state. The variation of the crop and operational seasons help to maintain a steady supply of livestock.

Rajasthan, the supply of animals is large and season operates for 8 to 9 months. Animals are found in good bodily condition and available at reasonable price. When the bigger producing centres are not operating and animals are procured from small centres, the price is high. There are other contributory factors, which affect the price of livestock, like natural calamities, namely drought, floods, transportation difficulties, demand and supply.

Climatic conditions of Rajasthan and Gujarat are best suited for the production of livestock. Scanty rain, dry climate, and regions with bushy shrubs and grass lands are most favourable for rearing of sheep. Sheep thrive better on the plains. Where the landscape is hilly and the rainfall is more, the goat population thrives. In the business of rearing, producing, marketing, slaughtering and sale of meat, a particular class of society is involved. This profession and business have become the monopoly of the caste and none else is able to come into the

business and thrive. This community is known by different names in different states, viz. Gujar, Raika, Jhat, Sindhi, Raval, Bhabari, Maldari, Bepari in Northern India; Bhanger, Gawal, Kuruba are the community operating in Maharashtra and other states. They are found to lead a nomadic type of life, driving their herds from place to place, where the natural grazing in the farms or bushy hillocks are available. They book the fields for grazing after the Rabi crop. This is for mutual benefit of him and the farmers; the farmer gets his field manured. It is observed that this rearing and bringing up livestock has become inherent hereditary profession in the precincts of hilly farms, far away from the centres of modern developments of Animal Husbandry. They follow their own age-old orthodox methods of breeding, rearing, grazing which are dependent on natural foliage available, without the least consideration or knowledge of balanced diet or preventive medical care for producing good quality meat animals. Being illiterate their economic conditions do not enable them to feed their livestock with additional feed material than the naturally available foliage.

Similarly, the persons concerned in other operations viz., merchants, brokers, shroffs, caretakers, butchers and their workers in marketing, slaughtering, and sale of meat come from a particular category. When modern improvised methods are suggested, they show an apathy for the improved techniques and operations and on the contrary oppose the same. Slaughtering and selling of meat is restricted mainly to a particular section of the Muslim Community. Where religious sentiments are attached to the slaughter and consumption of meat, Hindus like Sikhs, Gurkhas, Jhath, Rajaputs, Dogras, and Marathas, have been doing this business.

Merchants and/or their agents visit villages, where these animals are grazing and

directly deal with these persons. Depending upon the circumstances and the need the herds are taken out for sale. The herds intended for sale, males and females, are separated and females are retained for breeding. In case of goat males range from 1 to 3 years of age. Females are slaughtered after 3-4 years breeding. In case of sheep these animals are retained for a longer period for the sake of their wool before they are sold to the butchers.

Sale is by bargain. Price is fixed per head. The transaction is in cash. The animals are marked out and kept in charge of the farmer, token advance is paid and the balance while removing the animals.

Animals, purchased at different villages, are gathered at a centre. From these centres animals are transported for marketing at terminal livestock market at consuming centres. Railway transport is cheaper but takes longer time and involves transshipping. The road transport takes less time and reach the consumer terminal markets within 36-48 hours, as compared to 8-10 days by Railways.

Humanitarian League and the Society for Prevention of Cruelty to Animals have specified the number of animals permitted to be loaded in a truck depending on its size and type. The Road Transport Organisation of the Government also supervises and imposes check on the number of animals loaded in trucks. In Maharashtra, medium sized truck is allowed to carry about 50 animals. It is not uncommon that upto 150 animals are loaded in normal sized big trucks from these centres upto the city border. Then these animals are distributed into 2 to 3 vehicles at the border to escape from S.P.C.A./R.T.O. action.

'Weekly Marketing' operates at many places. This system is called 'Haath', 'Bazaar', 'Mandi' or 'Mandai'. Animals which are not sold out in a particular, weekly market, are taken to next place where the marketing

is held on the following or subsequent days. Thus the activity takes place on all the days of the week and the merchants and brokers are kept busy going round their business. It also helps the business from the surrounding areas to go to a particular house and make purchases.

The livestock market at Ganesha Abad, Ranchi, is the biggest in India. Sheep and goats are brought to this market from Rajasthan, Mewar, Madhya Pradesh, Uttar Pradesh, Gujarat, Maharashtra etc. Marketing of sheep and goats is held twice a week. On an average 25-30 thousand sheep and goats are brought for sale on each of these marketing days.

Merchants bringing animals from these producing centres are issued necessary licences by Municipal Corporation of Ganesha Abad. Animals brought without licence or permission are liable to be seized and disposed of, as per the provisions of the Ranchi Corporation Act.

As soon as the animals arrive at the Livestock Market they are unloaded at a specially built ramp of the Marketing Yard, where

provisions of drinking water and medical attention are made. As found in advanced conditions and in a new surrounding emergency slaughter taken for slaughter in the Emergency Slaughter Unit. Animals found with from contagious or other diseases segregated quarantined. The animals are loaded into to Ganesha carters and all such animals are taken to Licensed Marketing Yard, brokers or Dalals operating in the market take charge of these animals and sell to the buyers. The unit of sale is known as 'Kudi'.

The Indian Government is that 20 animals of equal age and weight are grouped together and entered for sale. The merchant is the price of the more (Kudi) by a broker 'Pradhani' as a guarantee of the price. The commission or 'Dalal' charged by broker (Dalal) for selling the animals by the broker (Pradhani) for advance money is deducted from the price of animals paid to the merchants. current rate of the commission varies

Number of animals brought for slaughter in Ganesha Abad

Year	Sheep and goats	Bull calves	Bulls (14 C)	Cows	Calves
1961-62	74,88,774	10,712	68,260	14,200	100
1962-63	76,42,073	11,473	77,260	14,760	100
1963-64	76,42,073	12,552	78,607	14,211	100
1964-65	76,42,073	17,002	78,677	11,700	100
1965-66	76,42,073	14,000	76,700	11,800	100
1966-67	76,42,073	17,000	77,070	18,500	100
1967-68	76,42,073	17,000	68,000	23,000	100
1968-69	76,42,073	19,170	77,007	20,000	100
1969-70	76,42,073	22,000	81,000	21,000	100
1970-71	76,42,073	22,000	81,000	21,000	100
1971-72	76,42,073	22,000	81,000	21,000	100
1972-73	76,42,073	22,000	81,000	21,000	100

and Pudukkottai in Bombay markets at 9 each per 'Kudi'. Average price of one of animals is Rs 1,500.

Under the present system butcher enjoys comfortable position. He is not required to invest. Besides getting animals on loan, he also receives amount in advance from the businessmen dealing in by-products like skin, guts and edible offal or by way of forward sale contract. The period of this forward sale is different for different items. The dealers in the city try to exploit one another by underbidding and resorting to various tactics and malpractices. All this put together results to a tremendous wastage and chronic shortage when compared to the modern improved scientific lines of operation yielding better quality products with a minimum of export trade.

To provide benevolent opportunities and chance to every butcher and to prevent present malpractices in the trade, at near Abastole, a scheme has been worked out.

According to this scheme a 'Price Board' is proposed to be constituted of representatives of butchers, traders and slaughter house officials. The slaughter house authority will arrange for collection of by-products, process and dispose them through different trade organisations or pharmaceuticals as the case may be. A fair price for these products would be worked out and paid to the butchers in consultation with the members of the Board.

A scheme is also suggested for banking facility and for advancing loans to the butchers through Co-operative Banks. On guarantee given by two other butchers in a group of three butchers, advance of loan can be arranged at fair rate of interest at least the present 52.4 per cent. The scheme will be under the administrative control of the Municipality which can also call upon him to repay the loan.

There was a system called 'Vanda' (disapproval or objection). According to this system, the price of skins that could be realised in being attended by the skin dealer and if the skin dealer disagrees with the price, the butcher expects the animals are returned to the merchants even upto 24 hours after the sale. This puts the merchant in a very precarious position as the animals are returned after the marketing hours. He cannot get suitable price for these returned animals and he is compelled to dispose them at a far lower price. The cash transaction will also do away with another malpractice called 'Kumar' whereby 5 per cent deduction is made in the price of animal paid to the merchants for the guaranteed payment by the butcher and as concession for regular purchasing.

It is also realised that the prices of these animals realised at the markets at Bombay and other prominent ones and the prices paid to the farmers at their producing centres differ very much. The middle persons in the trade realise greater margin. It is felt very necessary to work out a scheme whereby these animals are directly transported to terminal markets by avoiding as many of these intermediaries as possible, and actual price realised in the consumer markets is paid to the producers directly.

Even though the primary producer strains hard and exerts all through the year and produces the livestock, he gets only a meagre price. Unless schemes are worked out and introduced, with the force of enactment, the economic condition of the primary producers in rural villages will not improve and the picture of national economy will remain as it is. Schemes based on these principles will be the main foundation on which national economy will rest and the improvement of primary producers in every such sphere will bring overall improvement of National Economy.

Book Reviews

Technology of Wine Making (Third Edition):

By M. A. AMERINE, H. H. BERD AND K. V. CRUESS, Published by The AVI Publishing Company, Inc., Westport, Connecticut, 1972, pp. ix+802.

The revised book on the technology of wine making contains exhaustive information on various aspects of wine technology. It is an excellent text book for those who wish to acquaint themselves with the processes involved in the production of different types of wines and brandy and the principles underlying the process.

There are twenty chapters covering variety of subjects in the field of wine technology. The following subjects have been dealt at a greater length and a lot of new material has been added.

- (a) chemistry of fermentation and composition of wines.
- (b) changes in state and federal regulations.
- (c) Winery design, equipment operation and sanitation.

First chapter covers the statistical and comprehensive figures over a period of three years regarding the acreage of vineyards, wine production and consumption in important countries. Wine of various regions are described and factors responsible for the quality have been discussed. Soil, climatic conditions and many other distinctive factors influencing the quality are enlightened.

Under the chapter of composition of grapes, both physical and chemical changes, changes in total sugars (dextrose and levulose), acidity and pH during ripening are presented with graphical representations. Formation of odorous material during ripening and changes in colour

during maturation are explained and their importance is stressed. Reasons for determination of field maturity and the methods of maturity measurement are explained.

The definitions, composition and nomenclatures of various American types of wines are explained in chapter 3. The next chapter discusses the species of yeasts and moulds of importance their occurrence, morphology and general properties.

New methods of employing the pressure fermenters for controlling the rate of fermentation is well explained. Various organic and inorganic compounds and their leads in wine are interestingly dealt in 5th chapter.

Equipments and operations from crushing to bottling is explained. Principles underlying the various operations are highlighted. Fortification, storage and ageing have been explained well. Sanitary problems and methods of accomplishing the same is discussed. A list of cleaning and disinfecting agents is also published here.

Chapters 7-10 deal with the production of red table wines, white table wines, production of sherry, port and other dessert wines. Product differentiation, detailed process of each of the products, varieties of grapes used and other problems of production are discussed.

The definition, type, processing, blending and bottling of sparkling wines are explained in detail in chapter 11. Methods of production of vermouth, non vermouth types and special natural wines are dealt in chapter 13.

Chapter 14 deals with the production of different fruit wines viz. cider and apple wines. Methods employed in several countries are given in detail.

Factors responsible for enzymatic colour change and non-enzymatic (metallic) deterioration and stability tests are brought out in chapter 15.

Causes of bacterial spoilage, types of organisms usually associated with this and spoilage by yeast and their control are dealt under chapter 16.

Types of brandy and their definition details involved in the manufacture of brandy are explained. Pot still and Metzner still are very clearly explained. Removal of fusel oil and aldehydes and fortification and ageing of brandy have been dealt in great detail.

The production of tartrates, concentrates, oil and tannin from grape seeds, and vinegar as winery by-products are dealt in chapter 18. The importance, purpose and the mode of evaluation of wines and brandies are discussed in chapter 19. Various characters that are to be considered are highlighted. Taste testing, numerical evaluation in scoring of wines and triangular taste tests are also brought out in detail.

Legal restrictions that are involved in the production of wines and brandy are explained in chapter twenty. This chapter has been dealt in detail taking into consideration the legal requirements that are to be observed during different stages of processing.

Literature references are cited at the end of each chapter. This book will be a useful reference in the wine making industry as it has ably covered the requirements of the industry.

H. A. DEVENDRA KUMAR

Bibliographic Guide for Editors and Authors: published by Chemical Abstracts Service, Box No. 3012, The Ohio State University, Columbus, Ohio 43210, U.S.A., pp. 385; price \$9.50.

Biosciences Information Service of Biological Abstracts (BIOSIS), Chemical

Abstracts Service (CAS) and Engineering Index, Inc. (Ei) have collaborated and published Bibliographic Guide to provide authoritative abbreviations and codes for the serial literature.

Documentation standards is an annotated bibliography of U.S. and international documentation standards that cover the range of questions that arise in the writing for and the editing of the primary scientific and technical literature.

Title Abbreviations and Codes lists 27,700 scientific and technical journals monitored by BIOSIS, CAS and Ei. Approximately 18,500 of these titles are of journals currently being published; 9,200 titles are former titles and titles for discontinued journals.

Evaluation Report No. 93, FAO International Food Technology Training Centre, Central Food Technological Research Institute, Mysore City, India, by GEORGE F. STEWART, Food and Agriculture Organization of the United Nations, Rome, 1974.

The FAO/International Food Technology Training Centre was established by FAO in 1964 at the Central Food Technological Research Institute, Mysore, India, as it had excellent facilities and a scientific and technical staff engaged in research on food problems which are similar to those of many other countries in the region of South and South East Asia.

The Centre has been in operation now for 10 years and has trained nearly 800 persons of which 200 earned Masters Degree.

While FAO has carried out evaluations of the centre previously through questionnaires and correspondence, it was felt that there was now a need for a more comprehensive personal evaluation. Mr George F. Stewart, Professor, Department of Food Science and Technology, University of California, Davis, California, U.S.A., was

requested by IAO to carry out such evaluation.

Prof. Stewart in his report made very important recommendations after studying the present Administrative and Supervisory set-up, Fiscal/Financial office, Post-Graduate Curriculum, Short-term courses, etc.

Appendix include:

A. Objectives and Terms of Reference

B. (i) Expenditure Statements—Aug. 1972/July 1973

(2) Indian Industrial Support—

1972/July 1973

(3) Commitment Forecast—

1973/July 1974

(4) Various Financial Support to Post-Graduate Course

C. Curriculum of the M.Sc. D. Course in Food Technology

D. Syllabus

E. Student Evaluation Form.

Dr. A. G. NALY-KIRATI

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NOTES and NEWS

Preservation in Processed Foods

Coating and Glazing Material from Squilla

Occurrence of White Patches in Canned Apples—Causes and remedies

Annual Symposium on Refrigeration and Air-Conditioning

Workshop—Aerial Spraying for Plant Protection

Annual Seminar on Mango and its Utilization

1-term course in Fruit and Vegetable Technology

International Food Technology Training Course

Adulteration in Processed Foods

Food, clothing and housing are perhaps the most vital, basic and perpetual needs of mankind. The world population today stands at a staggering figure of 3.6 billion and is estimated that in the next 25 years, the population will more than double. The world is faced with a stupendous task of providing for its basic needs.

When not available in plenty given the present situation where the traders and producers resort to adulteration or selling inferior quality material.

Food processing is essentially done with a view to preserving and conserving the food which otherwise is perishable. It is done with a view to incorporate the food in handling and storage during transportation from site of production to the site of consumption. (3) Processing of food is done with a view to offer convenience to the consumer. (4) It is done with a view to nutritionally balance the

product which may ultimately reach the consumer.

Adequately processed food should be free from (a) mechanical impurities, (b) undesirable enzymes, (c) oxidative deterioration, (d) infestation and (e) extraneous material.

It was Archimedes who first used the principle of density to find a way to detect adulteration in metals. Adulteration in one way or the other involves the clandestine cheapening or debasement of an article to the detriment of the buyer or user. It is invariably a process of dilution by extraneous material. It has been recognized as a common form of economic deprivation and a type of commercial thievery by adopting dubious or sly means.

According to Prevention of Food Adulteration Act of 1954, an article of food shall be deemed to be adulterated if—

- (1) it contains any other substance which affects or if the article is so processed as to affect injuriously the nature, substance or quality thereof;
- (2) any inferior or cheaper substance has been substituted wholly or in part for the article so as to affect injuriously the nature, substance or quality thereof;
- (3) any constituent of the article has been wholly or in part abstracted so as to affect injuriously the nature, substance or quality thereof;
- (4) the article has been prepared, packed or kept under insanitary conditions whereby it has been contaminated and has become injurious to health;
- (5) the article consists wholly or in part of any filthy, putrid, rotten, decomposed or diseased material or

is insect infested or is otherwise unfit for human consumption;

- (6) the article contains any poisonous or other ingredient which renders it injurious to health;
- (7) the container of the article is composed whether wholly or in part of any poisonous or deleterious substance which renders its contents injurious to health; and
- (8) any colouring matter other than prescribed in respect thereof and any amounts not within the prescribed limits of variability.

Besides defining what constitutes adulteration, PFA also has provisions for misbranding the food material with the intention to protect the consumer from purchasing untruthfully labelled package containing food material.

The objectives of the PFA Act are:

- (i) to protect the public from harmful and poisonous foods;
- (ii) to prevent the sale of sub-standard food material; and
- (iii) to protect the consumer from being deceived or cheated.

In the case of raw material which is sold in its natural form, the consumer is subject to less chance of being cheated because the identity of the raw material is fairly known to the consumer. But in case of processed foods, the consumer has no chance to look into the contents and hence it is very much pertinent that the interests of the consumer are protected by adequate legislation.

Consequences of adulteration, whether deliberate or accidental, will be either (a) health hazards or/and (b) economic deprivation. These two aspects need further elaboration.

Health hazards are caused:

- (i) When the food bears or contains poisonous or deleterious substances which may render it injur-

ious to the health of the consumer, e.g. cheese coated with lead foil or potato treated with strong borax solution.

- (ii) When it consists in whole or in part filthy, putrid or decomposed substance, e.g. butter processed from decomposed or moldy cream.
- (iii) When it contains added poisonous or deleterious substances which need not be utilized, e.g. beer in which fluorine is added or processed foods with unpermitted colours.
- (iv) When it is prepared, packed or held under insanitary conditions whereby it may become contaminated with filth or rendered injurious to health, e.g. insect infestation of cereal grains or products processed with polluted water supply.
- (v) When food is processed from diseased animals or animals which died due to causes other than slaughter.
- (vi) When its container is composed of poisonous or deleterious substances which may render the contents injurious to health, e.g. lead containers.
- (vii) When the product contains uncertified colours whose safety has not been convincingly established.

Economic aspects

Adulteration is practised for economic gains by unscrupulous traders. The following types of fraud can be committed whereby the final product, though resembling the original one, will have lesser nutritive value and other quality characteristics.

- (i) When a valuable constituent has been, in whole or in part, omitted or abstracted, e.g. butter containing less than 80 per cent fat or milk containing less than prescribed

limits of milk solids or spent tea dust or extracted spices.

(ii) When a substance has been substituted wholly or in part, e.g. substitution of puffed wheat in nut candy bar.

(iii) When damage or inferiority has been concealed in any manner, e.g. pure egg noodles containing no egg solids but coloured to convey the impression.

(iv) When a substance has been added to increase its bulk or weight or to reduce its quality or strength or to make it appear of greater value than it actually is, e.g. addition of water to milk or mixing of spent tea with good tea dust.

There are a number of possibilities for processed foods to become adulterated in the eyes of the law. It may be worthwhile to examine these possibilities in a little more detail.

(i) *Presence of harmful substances in food:* Deleterious substances in foods fall into two categories (a) those indigenous to the products, and (b) those added to the food. Though a number of foods may develop injurious properties, sometimes they are added to the food either intentionally or by chance. A considerable number of poisonous substances are employed in food production and crop growing. It is common to use toxic insecticides and fungicides to bring the crops to maturity without spoilage and the methods of post-harvest handling do not remove every trace of the harmful residue from them. Naturally, these residues find their way in the processed finished product.

Similarly, use of chemical preservatives is an economic necessity to preserve perishable foods. But most of the chemicals are injurious in nature while the safety of others is being questioned frequently. Though in India, the use of benzoates, sulphur di-

oxide and sorbate are legally permitted, they are theoretically deleterious to the human system. However, the use of these chemicals can be justified when we realise that the dangers resulting from the use of these chemicals may be naturally less than those ensuing from the consumption of decomposed and deteriorated food products. Use of non-permitted additives and even permitted ones above the levels prescribed has to be restricted to limit the concentration of chemical substances in the processed foods. Most of the adulteration cases arise out of the mistaken notion on the part of the industry that the chemicals will make food absolutely safe for consumption, though this is not true always.

Chemical contamination of a minor nature occurs at times in the course of food processing. For example, it is very difficult to remove all traces of arsenic from certain dye intermediates employed in foods. Similarly, certain poisons such as most of the heavy metals are cumulative in their effect upon the human system. These contaminants have to be kept at lowest levels possible. Careless processing may increase their levels and this can be checked only by deterrent action as envisaged in the Act. An enlightened manufacturer will always see to it that the presence of substances causing health hazards is kept to an unavoidable minimum. If there are any cases where the Act is impracticable, this can always be looked into for suitable modifications. Recently, the provisions regarding presence of artificial colours in certain processed food products have attracted wide criticism from the industry. One of the arguments put forward has been that the artificial colours available in the country are not always pure and the actual users of these colours are penalised for no fault of theirs. May be, this is a point worth looking into.

The aim of the provision in the Act is to protect the health and welfare of the con-

sumer public from all types of deleterious products. But it is also essential to establish relatively safe tolerances where addition of toxic substances is unavoidable or is made essential by the exigencies of production. By providing tolerance limits in most of the known harmful substances based on available information, it has been possible to eliminate or reduce to a negligible minimum poisons in all processed food products.

Some of natural poisonous substances present in certain foods are given below:

Beans	Glycosides yielding hydrocyanic acid and trypsin inhibitors and other anti-nutritive factors
Shell fish	Poisonous variety
Mushroom	Poisonous variety
Sprouted potatoes	Solanin (a gluco alkaloid)
Rye and other grains	Ergot
Buckwheat	Fagopyrisim causing agent activated by light
Another source of harmful substances is infected foods:	
Animal parasites	Tapeworm, <i>Trichipella spirallis</i> in meat; round worm in strawberry and lettuce.
Bacterial parasites	<i>Tubercle bacilli</i> , <i>Streptococci</i> and <i>Diphtheria bacilli</i> in milk; <i>Eberthella typhi</i> in oysters; <i>Salmonella</i> in most foods; <i>Cl. botulinum</i> and <i>Cl. tetani</i> in most foods. Aflatoxin etc.

Presence of foreign particles also can cause harm to the consumer.

Cocoa shell	Cocoa powder
Saccharine	Beverages
Paper/chaff/screenings/cinders/grits/sand/dust and mud	In many foods
Sharp oyster shell fragments	Oysters
Mineral glass like substances	Canned products
Broken glass	Cheese, butter and candy

The chemical contaminants which can cause immense harm are great in number. Thus chemicals belonging to the following categories can cause harm: antiseptic, fungistat, germicide, mold inhibitor, antioxidant, neutraliser, stabilizer, emulsifier, firm-

ing agent, colouring agent, flavours, bleaching agents, insecticides, metallic traces, etc.

(ii) *Contaminated foods*: A processed food product can be termed adulterated if it is (a) a filthy food, (b) a putrid food, (c) decomposed food, (d) foods unfit for consumption, and (e) food from deceased animals or some plant sources.

A food becomes unfit for consumption primarily due to (1) changes in physical condition which makes the same wholly inedible or rob it of its value as food, and (2) injury or changes in appearance, odour, taste or texture. A few examples of contaminated foods are given below:

Lemon juice	Metallic taste
Biscuits	Contaminated with mineral oil
Butter	Offensive odour and flavour
Mayonnaise	Rancid
Canned tomatoes	Rusted interior
Coffee	Old, stale and deteriorated flavour
Spices	Stones
Candy	Naphthalene
Sugar	Salt water
Coconut oil	Rancid

(iii) *Insanitary environment and unhygienic processing*: Sanitary conditions prevailing in the manufacturing premises have a bearing on the quality of food produced by any processor. The location of the food processing plant, the plant structure, the nature of floors, walls and ceilings, lighting and ventilation, protective devices against contamination, pest control, waste disposal, personnel hygiene and type of processing operations, all influence the ultimate quality of the food. Most important, contamination of the raw materials used also contribute to insanitary conditions in the plant. It is possible to avoid manufacture of 'adulterated' foods by strict control over the quality of raw materials used and by maintaining hygienic practices during processing.

(iv) *Use of deleterious containers*: Food products are packed in containers to afford protection and also to increase the attractiveness of the food. However, these very

containers can contribute deleterious substances to the food packed in them.

e.g. (a) Packaging of milk in unsterilized bottles, cartons, etc.

(b) Canned foods can develop hydrogen swell, leaky gaskets, leakers, springers, flippers, internal corrosion.

(v) *Economic adulteration*: This type of adulteration is a deliberate act on the part of the processor, primarily to gain economic advantage.

There are four types of economic adulteration:

(a) Valuable constituents omitted or abstracted:

1. Coffee—caffeine has been extracted
2. Whole milk—cream removed
3. Cocoa—cocoa fat removed
4. Whole wheat flour—germ removed.

(b) Substitution of certain ingredients:

1. Butter fat—Substitution with mineral oil
2. Condensed milk—cane sugar added
3. Egg noodles—egg yolk used in place of whole eggs
4. Synthetic flavours—in place of natural flavours
5. Milk—excessive water
6. Fruit juices—added water.

(c) Concealment of damage or inferiority—Mostly this is done by artificial colouring of the inferior foods.

1. Immature oranges—coloured with dye
2. Undercoloured tomatoes—coloured with dye
3. Tomato paste—coloured with dye.

(d) Deceptive addition to foods—This practice is usually resorted to by the trader to (1) increase the bulk weight, (2) reducing quality or strength and (3) making it appear better or greater quality than it really is. Some of the examples are:

1. Addition of water to milk
2. Coffee mixed with chaff
3. Spent tea with good tea dust
4. Spice powders with wood shavings or dung.

How can adulteration be prevented?

There are several ways and means by which incidence of adulteration can be minimised if not eliminated altogether. These are only few suggestions:

(i) *Put more teeth into the law*: This is already being done, the Central Government being determined to pass the PFA Amendment Bill, 1974, which has been drafted to plug the many loopholes experienced by the enforcement authorities. At the same time, care has been taken to protect genuine processors by providing suitable clauses. Thus a sub-standard product not measuring up to the standards of identity prescribed will be given every chance to see whether the same can be reprocessed into a standard product.

(ii) Lay down standards for those foods which are not covered by the Act at present. This will have to be done taking into consideration the variations encountered from region to region.

(iii) There should be a uniform method of analysis throughout the country and this should be made known to all the analytical laboratories as well as to the food industry. Discrepancies in analytical results and their interpretation can then be avoided.

(iv) Qualified personnel are employed by the industry to plan and supervise the production activities. Similarly, the industry will have more respect and confidence in qualified food technologists or food chemists who have the basic knowledge of various processing operations, if they are to man the enforcement machinery. More and more food technologists and food chemists should be considered for appointment as food inspectors and public analysts in future.

(v) Developmental work should be encouraged to standardise analytical methods applicable to indigenous processed foods. Fool proof methods may have to be devised and the industry can be taken into confidence for the purpose.

(vi) Efforts should be made to make available to the food industry chemical additives such as colours, flavours, preservatives, etc., which are certified by a statutory agency such as ISI. This can be expected to go a long way in reducing the number of cases of adulteration due to addition of non-permitted colours.

PFA Act vis-à-vis new product development

PFA Act has no doubt laid down comprehensive standards of identity for a number of products. But it is pertinent to see the Act does not hamper the development of new products in any way. CFTRI, being engaged in research on the development of new products, is vitally concerned with this aspect. One of the areas of research in CFTRI is development of nutritional products using cheap and abundantly available raw materials in the country. These types of products can attract certain provisions of the Act pertaining to economic adulteration where cheap raw materials are used. A few samples of new product development are cited below:

(i) *Miltone*: Miltone is a milk like substance prepared out of animal milk and groundnut protein isolate. The purpose of developing this product is to stretch the available supply of milk to the maximum extent. According to PFA Act, 'Miltone' cannot be distributed as milk since the standards of identity of milk are not applicable to Miltone. However, keeping in view the overall benefit that can be expected if such a product is produced on a large scale, provisions have to be made for separate identity of standards for Miltone. If the

Act is diluted so as to accommodate Miltone like products, some of the unscrupulous milk processors can take advantage of it and make all sorts of products which may be classified as adulterated.

(ii) *Fortified atta*: In order to raise the nutritive value of atta from whole wheat incorporation of edible groundnut flour or groundnut protein isolate has been recommended. Though according to regulations this may be a form of adulteration the intent of the R & D worker is to increase the food value in terms of nutrition of a staple food item.

(iii) *Infant food*: The development of infant food formulations using milk and plant nutrients can be expected to ease the shortage of animal milk in the country which is handicapping the manufacture of milk-based infant foods. Moreover, the cost of animal milk/plant nutrient combination would be significantly lower than that of conventional infant foods. Here also from the nutritional point of view the new product is as good as milk foods, though one can term it as economic adulteration.

(iv) *Simulated meat products*: With the advancement of food technology, it is possible now to simulate the texture as well as flavour of meat products using plant protein sources.

(v) *Coffee/Tea whiteners*: This is also a useful product developed as a substitute for milk in coffee and tea.

(vi) *Partially defatted groundnuts*: A portion of the oil can be extracted from groundnut kernels without significantly affecting its shape. Such a product has a higher protein content. Though this can be termed as a kind of economic defraudation, the product need not be sold as whole groundnut kernel. Separate standards of identity can be easily set up for it.

(vii) *Composite flours*: Since they are blend of different materials, separate standards may have to be evolved.

Since the purpose of developing these new products has been either to produce more processed foods to be made available to a wider spectrum of population or to economically utilize raw material having some food value, it is necessary that separate entity is established for newly developed products so that genuine manufacturers can be persuaded to take up their production. Though these can be interpreted as a kind of economic adulteration, one vital difference is that most of these products are nutritionally almost equivalent to or in some cases better than original/conventional products. The ever increasing demand for more food can be satisfied only if such developmental activities are encouraged. At the same time maximum care is to be exercised not to give any opportunity to unscrupulous traders to practise economic defraudation under the pretext of new product development.

B. L. AMLA

Sizeing and Glazing Material from Squilla

The Central Food Technological Research Institute, Mysore, has developed a process for the production of a highly viscous Chitosan (2-amino-2-deoxy-D-glucose) from squilla, a trash fish.

Large quantities of squilla or *Puchee* are caught along with prawn catch, its total daily catch along the Mangalore coast alone being about 1½ tonnes. The bulk of this potentially rich industrial raw material is thrown away as waste at the landing site. This has been causing problem as the accumulated waste produces offensive smell due to rotting. Utilization of this waste for production of chitosan will improve the economics of fishing industry.

Chitosan is easily soluble in 1-2 per cent acetic acid without heating and gives a very viscous solution on dissolution.

Experiments are in progress to find out its utility as a glazing material for paper and

as a sizeing material for printed or coloured fabrics and knitted linens.

The Occurrence of White Patches in Canned Pineapple—Causes and remedies

Pineapple is one of the important fruits of India. It is mostly grown in Kerala, Assam, Orissa, Karnataka, Tripura and West Bengal. The fruit is valued more when canned or processed rather than in the fresh form.

A study on 'the occurrence of white patches in canned pineapple' was initiated on account of the basis of frequent reports that the pineapple processed in Kerala was found to have more white patches than that processed in Assam and Tripura regions of this country.

Exploratory studies were undertaken on the most important commercial variety of pineapple grown and processed in Kerala namely '*Kew*' or '*Giant Kew*'. Pineapple fruits from four localities around Trichur and at different stages of maturity (80-130 days after flowering) were procured in order to find out whether the occurrence of white patches in slices was due to (i) seasonal variations, or (ii) soil conditions in different localities, or (iii) due to differences in maturity levels at the time of harvest or (iv) due to varietal differences or (v) any other factors. By investigations, it was observed that the white patches were not due to seasonal variations or to the different soil conditions. By conducting systematic studies, it was found that the ovary wall and thick septa of the fruits became fleshy and juicy and formed the sweet edible part of the pineapple fruit. The same fleshy ovary walls and the fused basal part of the bracts were generally yellow to light yellow in colour while the septa were invariably whitish in appearance. It is this phenomenon which caused the appearance of white patches in canned pineapple.

It is inherent genetic characteristic of the *Giant Kew* variety itself.

In order to ascertain whether white patches were a variety characteristic, preliminary studies on the screening of 16 pineapple varieties, grown at Kannara Pineapple and Banana Research Station, were conducted. Only seven varieties namely *Queen*, *Espinola Roja*, *Pullimath Local*, *Charlotte Rothschild*, *Mauritius*, *Repley Queen* and *Alexandra* were found free from white patches.

The occurrence of white patches in canned slices in relation to maturity of the fruit was studied in *Giant Kew* variety. The fruits harvested at 80 to 90 days after flowering were found to be immature and the flesh colour was dull white to pale white with distinct white patches; they were found to be unfit for canning. The canned slices at this stage of maturity were light cream yellow in colour, hard in texture with raw taste and lacked the characteristic flavour of pineapple. The white patches were very predominant and clearly visible in these slices. The fresh pineapple slices at 105 days of maturity were cream yellow in colour with slight appearance of white patches. After processing and storage, the slices were pale yellow in colour and the white patches were fairly visible. The texture, flavour and taste were normal and good. The slices of pineapple fruits picked at 115 and 120 days maturity were yellow in colour with slightly visible white patches, but after processing and storage, they gave an excellent canned product; the slices had golden yellow colour and were practically free from white patches. The observation at 130 days of maturity indicated that the slices were golden yellow in colour with very slightly visible white patches, but the product after processing was dark yellow in colour and free from white patches. The slices were, however, slightly soft due to the over-ripening.

The problem of white patches in pineapple slices can be practically overcome by processing the pineapple picked at the optimum stage of maturity (115-120 days after flowering under Trichur conditions). Besides, the pineapple canned at this stage of maturity improved the eye appeal, taste and flavour of the slices canned.

CFTRI
Experiment Station
Thiruvambadi, Trichur

National Symposium on Refrigeration and Air-Conditioning

The third National Symposium on Refrigeration and Air-Conditioning was held at Central Food Technological Research Institute (CFTRI), Mysore, from 18th to 21st July 1974. The Symposium was sponsored jointly by the CFTRI, Ministry of Defence, All India Air-Conditioning and Refrigeration Association, Association of Food Scientists and Technologists (India) and the Institution of Engineers, Mysore. 140 delegates consisting of research scientists, design engineers, manufacturers of machinery and equipment, management executives and government officials attended.

Dr A. Ramachandran, Secretary, Department of Science and Technology, Government of India, inaugurated and Shri D. J. Balaraj, Development Commissioner, Government of Karnataka, presided.

Inaugurating Dr A. Ramachandran said that heat and mass transfer in food products, whether they are of vegetable or animal origin, is a complicated problem. Consideration has to be given to quality retention during processing. Thus impose severe restrictions on processing operations. To study any problem of heat or mass transfer in food products, it is necessary to have complete data relating to their thermophysical and moisture transport properties under varying conditions of

INDIAN FOOD PACKING

temperature, humidity, physical state, source from which the material is obtained and processing conditions. In view of the large number of variable parameters involved, it is best to determine these properties experimentally in each case in a systematic manner and tabulate them for later use. This is a very important step in the economy of the processes and in controlling the quality of the products.

Cooling of food products to retard their deterioration during storage and freezing to achieve increased storage life is a well known process. Determination of the cooling loads and time-temperature characteristics is important to exercise control over the quality of products and economy of processes. Moisture migration and the controlling effect of the surface moisture can have a profound influence on the processes.

Extensive studies of products to understand the basic mechanism of freezing have been made. There is a necessity to make generalised studies on mathematical models to predict freezing characteristics of analogous shapes. Also studies on cryogenic freezing with LN_2 and LF_{22} sprays with a view to evolve the most economic cooling systems and with minimum product damage are needed.

The other process involving both heat and mass transfer relating to food products is dehydration wherein economy and quality retention are important considerations. In most cases, air is used as the heat and mass transfer medium for solid foods. For food materials in liquid form, drum drying, spray drying, foam mat drying, and vacuum puff drying methods are used. Vacuum freeze drying is gaining popularity because of the high quality product it yields though it is still considered as a costly process.

Food products have to be dehydrated under 'low intensity' and 'high moisture'

conditions for quality retention. Under these conditions, rate of moisture diffusion within the body and surface evaporation are controlling factors. 'Spiked plate freeze drying' and 'Accelerated freeze drying' fall into this category. A recent trend in these techniques is to operate at not too high a vacuum and introduce gases like nitrogen, helium etc. This brings in the conception of convective heat transfer in addition to conduction and radiation effects in freeze drying. Detailed study of these heat transfer systems is needed to predict the freeze drying characteristics under these conditions. Also reduction in particle size of the product into pebbles or granules helps in reducing processing time. A technique recently being tried out is 'spray freeze drying' wherein the advantages of both spray drying and freeze drying are incorporated. Liquid is sprayed into an evacuated chamber and the spray deposits on the drier wall, where the heat of sublimation is supplied. This seems to be a promising method and deserves greater attention and detailed study.

Concluding Dr Ramachandran dealt on the intensive studies made on the economic conversion of solar energy into useful 'heat' or 'cold'. Applications of solar energy in heating are water heaters, boilers, air heaters and drying of foodstuffs. Its application in 'cold' is in harnessing the energy for refrigeration and air-conditioning, particularly for absorption refrigeration. Other areas are in evaporation of liquid foods, blanching, cooking and peeling; creation of vacuum, etc. All these make very interesting study, he said.

Shri D. J. Balaraj, Development Commissioner, Government of Karnataka, delivered the Presidential Address.

He said 'refrigeration and air-conditioning impinge on both agricultural and industrial policies and programmes. On the agricultural sector, it helps in preserving

perishable materials and in the industrial sector, it helps in careful husbanding of resources and utilisation of installed capacity in various spheres. The refrigeration industry can play a vital role in minimising waste to a large extent.

Shri Balaram stated that the World Bank has sanctioned a grant of Rs 56 crores for Animal Husbandry development in the State over a 7 year period, and indicated that this calls for a large outlay on refrigeration and air-conditioning plants for processes involved such as chilling and processing centres for milk, storing and freezing of meat, fish and other products. He emphasised the need for maintaining a cold chain for the transportation of such stored and processed products over long distances and suitable marketing facilities at different centres.

Cold storage of food is one of the several important applications of refrigeration. There are many other useful applications such as curing of large masses of concrete in dam construction, providing chilled water for industrial applications, ice plants for the fish industry, air-conditioning of hospitals, pharmaceutical and chemical industries, aircraft optical goods, production centres, instrument rooms and so on, which are essential necessities.

In spite of widespread application of refrigeration and air-conditioning, one finds that the installed capacity of the machinery industry is very much under-utilised. Consequently the prices of machinery are high. In addition there is the regular complaint that custom duty and sales tax on such machinery and equipment are very high as these are treated as luxury items. While there may be some justification to the demand for reduction in duties, the better way is to utilise the installed capacity fully and the equipment used to cater to the masses instead of individuals who come within the top 10 per cent of income by

installing large cold stores even areas to preserve the available materials.

The Symposium met in 5 sessions and 40 papers were presented. Latest researches and techniques and development in the field of food and air-conditioning were discussed. It brought into focus the problems of the refrigeration industry in areas where development are needed.

The Technical Session on Cold Storage of perishable products suggested work to be intensified and accelerated a time-bound programme so that it can be put to beneficial use on a commercial scale in view of the critical food situation in the country by:

- (1) Using irradiation and refrigeration for certain perishables including their cost structure.
- (2) Commercial scale freeze drying of perishable commodities with special reference to fruit juice, evaluation of comparative merits and demerits of other techniques.
- (3) Feasibility of using individual quick-freezing methods for ready-to-eat foods, ready-to-serve foods and vegetable products with nitrogen and different refrigerants.
- (4) Intensification of efforts for prolonging the storage life, preventing low temperature break-down, maintaining the organoleptic qualities of different tropical fruits with particular reference to mangoes.
- (5) Special attention to be given to establishing adequate refrigeration facilities in abattoirs and preservation of subclinical diabetes with special reference to pancreas (required for the manufacture of insulin).

ANA: Aerial Spraying for Plant Protection

Haryana Govt. has purchased five agricultural aircrafts from Hindustan Aeronautics, Bangalore, to launch a scheme of plant protection through aerial spraying in the State.

The scheme would initially cost Rs 45 lakhs. It is proposed to acquire a fleet of 10 aircrafts during the Fifth Plan period.

With the five aircrafts an area of three lakh acres out of ten lakh hectares under sugarcane, rice and oilseeds, where protection measures are required in a year, can be covered during the current financial year. The full implementation of the scheme would account for minimum annual yields to the tune of Rs 36 crores annually.

Annual Seminar on Mango and its Utilization

The Association of Food Scientists and Technologists (India), Eastern Region, will conduct a two-day seminar on 'Mango and its Utilization' on March 6-7, 1976, in Calcutta.

The seminar will discuss Scientific, Technological and Marketing aspects of mango and its products. The two-day seminar will consist of the following topics:

Raw material varieties, quality and horticultural aspects.

Technology of green mango products and quality control aspects.

Technology of ripe mango products and quality control aspects.

Marketing of mango and mango products, including export.

Technical papers for discussion are to be submitted in triplicate, graphs and drawings to be drawn in ink.

For registration and other details write to the Convener, Seminar Committee, AFST, Calcutta.

—AUGUST 1975

Eastern Regional Branch, Dept. of Food Technology and Biochemical Engineering, Jadavpur University, Calcutta 700 032.

Short-term Course in Fruit and Vegetable Technology

Applications are invited for admission to a 7-week Short-term Course in 'Fruit and Vegetable Technology', commencing from 6th October 1975 to 22nd November 1975, will be held in Central Food Technological Research Institute, Mysore. The medium of instruction is English. The tuition fee for the course is Rs 300.

The course will be of particular benefit to those directly associated with Fruit and Vegetable Preservation Industry. Preference to candidates possessing a Degree in Science Agriculture or Technology. Educational qualifications could be relaxed in the case of candidates with exceptional experience in the field.

Application forms can be obtained free of cost from the Chairman, Training Centre, CFTRI, Mysore 570013, Karnataka, upto 15th August 1975 by sending a self-addressed and stamped (25 p) envelope of 9" x 4" size. The completed application, together with a non-refundable application fee of Rs 5 by crossed Indian Postal Order in favour of Director, CFTRI, Mysore 570013, should reach him not later than 1st September 1975.

FAO International Food Technology Training Centre

The FAO International Food Technology Training Centre at the Central Food Technological Research Institute, Mysore, has completed 10 years of its activities of training in Food Science and Technology for participants from the South and South-East Asian Region both at the post-graduate level leading to the Master's degree in Food Technology of the Mysore University and short-term refresher courses in various

fields of specialization. The Centre has so far trained 255 participants in the post-graduate course and 346 in the short-term courses. In order to ensure the extent and nature of the benefits derived, as well as to assess the quality of training, two evaluation studies were carried out. The first one, 'Mysore Survey', was as a result of the feedback from the past participants at the Centre and the second one was carried out by Prof. George Stewart, President of the International Union of Food Science and Technology.

In order to consider these evaluations, review the present status of food science and technology in various countries of the region served by the Centre and to assess the future training needs, the FAO organised a meeting of the Liaison Officers from member-countries at the Central Food Technological Research Institute, Mysore, from January 9th to 11th, 1975. India was represented by Mr G. C. L. Joneja, Food Secretary, Government of India and Dr B. L. Amla, Director, CFTRI. Prof. Amara Bhumiratana, Director, Institute of Food Research and Product Development, Kasetsart University, Thailand and Dr I. H. Khan, Chief Food Research Officer, Department of Food and Agric. Marketing, Kathmandu, represented Thailand and Nepal respectively at this meeting. Dr H. A. B. Parpia, Senior Officer, Agricultural Services Division, FAO, Rome, represented FAO, Rome. Mr T. R. Parameswaran, Deputy Secretary, Government of India; Prof. M. N. Viswanathaiah, Dean, Faculty of Science, University of Mysore; Shri C. P. Natarajan, Project Co-ordinator, PP & FT Discipline, CFTRI and Dr S. P. Manjrekar, Chairman, Training Centre, CFTRI, attended the meeting as observers. Mr Joneja and Prof. Bhumiratana were unanimously elected Chairman and Vice-Chairman.

In his address, Mr Joneja mentioned that, in the World Food Congress held in Rome

in November 1974, special attention was given to the need for the development of economically sound food industries making use of appropriate technology for increasing food supplies, providing employment, stimulating agricultural production and increasing foreign exchange earnings through export of financial products.

As the training needs changed from time to time, periodic evaluation of its activities was required, so that they could be re-oriented in terms of the changing situations. In this context he felt that this meeting would help further improvement in the programme of International Food Technology Training Centre and make it more meaningful. On behalf of the Government of India, he assured the participants that the facilities available in the country were at the disposal of the countries in this region. He added that, as a result of the recommendation of the International Advisory Committee for the Centre, a project proposal for UNDP assistance from the resources allocated in India's country programme had been prepared for the continuation of the IFTTC for the next 5 years.

Dr Amla welcomed the members to the CFTRI and traced the contributions of the Institute, since its inception in 1950 and explained its R & D efforts in various Disciplines of Food Technology and at field stations located in different parts of India. He mentioned that the expertise developed at the Institute had been made use of in imparting training to the participants at the Centre. He mentioned that about 60 scientist-experts from various disciplines were participating in the training programme along with a nucleus staff from the Training Centre. He concluded by saying that the necessary infra-structure for advanced training in Food Science and Technology was available with the Centre.

Dr Parpia, while initiating discussions, stated that, from the exploratory evaluation

made by FAO through its participants and the report prepared by Prof. Stewart, it was evident that the Centre had fulfilled its objectives and the purpose for which it was started. He emphasized that there was a need for expanding these facilities to accommodate requests from various countries. He mentioned that, as a result of the establishment of the Centre, various other countries like the Philippines, Thailand, Nepal and South Korea had initiated food technology training and R & D activities in the region. He foresaw the establishment of a network of institutions capable of handling national and regional problems in specific fields, in co-operation with each other, where necessary. Interaction of the IFTTC, on the one hand and these centres on the other, would prove very valuable.

Prof. Bhumiratana traced the development of R & D and training facilities in the field of food science and technology in Thailand. Dr Khan narrated various measures taken by his Government to develop training and research facilities in the area of food science and technology.

The Committee noted with satisfaction the report of Dr Stewart and agreed with the suggestions [that the International Advisory Committee of the Centre should include representation from the participating countries of the region. It also strongly endorsed the recommendation that the representatives from the Centre should regu-

larly visit the participating countries of the region to assess the requirements of trained personnel for the food industries, research institutes and governmental agencies in the region. Most of the recommendations of Dr Stewart, in terms of the course curriculum, were adopted. As regards the short-term courses, it was decided to have priorities fixed in consultation with the participating countries of the region. The exploratory evaluation made by the FAO, as a result of the feedback from the past participants, was also adopted after certain modifications.

As a result of the discussions, an urgent need was felt for strengthening the existing facilities or setting-up new training facilities in the member-countries, which would include training periods between 6 months and one year in the form of post-graduate diploma courses. The meeting also stressed the need for advanced training leading to the doctorate degree and at post-doctorate level. It was suggested that for such a training, expenditure should be met either by the participating country or from other sources, such as fellowships from food industries, international agencies and bilateral arrangements. The Committee also felt that inter-country co-operation in training within the region would help to fulfil the specific sub-regional needs of the different countries and also to generate self-sufficiency for training within the country.

Export News

- Chain Contracts for Export not Exempt from Sales Tax
- Lucknow S.S.I.
- Rates of Exchange
- Marine Products
- Exports on Deferred Payment Terms
- Blanket Foreign Exchange Permits
- Trade Development Authority

Chain contracts for export not exempt from Sales Tax

Chain contracts (commercially known as back-to-back contracts) with the canalising of other agencies for the export of various items from the country cannot (except the last transaction in the series) be treated as contracts in the 'course of export' and will not be exempt from sales tax, according to a majority decision given by the Supreme Court in a chrome ore export case.

Till now the law on this point was not quite clear. The general view was that the sale by one local party to another local party could also be 'in the course of export' and exempt from sales tax if the latter exported it on the same terms. The present judgement sets at rest all doubts on the matter.

Lucknow S.S.I.

The Governor of Uttar Pradesh has constituted a Standing Committee under the Chairmanship of the Minister of Small Scale Industries in order to promote Export of Fruit Products.

Shri Kailash Nath has been appointed Convener, Agriculture, Forest and Horticultural Products Standing Committee. Other members of the Committee are:

- (1) Major Kapil Mohan, M's Mohan Meakins Breweries, Ghaziabad.
- (2) Chairman, Indian Sports Goods Manufacturers' Federation, Sur Kund, Meerut.
- (3) Agro Industrial Corporation, Lucknow (Representative)
- (4) U.P. Branch of Indian Sugar Mills Association (Representative)
- (5) The State Trading Corporation Ltd., New Delhi (Representative)
- (6) Director, Fruit Utilization, U.P.
- (7) Chief Conservator of Forests, U.P.
- (8) Haji Altaf Hussain, Bisauli Agricultural Farm, Sheikhpur, Gorakhpur.

Rates of Exchange

The rates of exchange for currencies are as follows with effect from 1.4.1975.

Foreign currencies equivalent to Rs 100

Austrian Schilling	208
Belgian Francs	432
Canadian Dollars	12.66
Danish Kroners	68.60
Deutsche Marks	29.50
Dutch Guilders	30.10
French Francs	53.20
Italian Lire	7960
Japanese Yen	3640
Norwegian Kroners	62.10
Pound Sterling	5.2950
Swedish Kroners	49.70
Swiss Francs	31.70
U.S. Dollars	12.67

In respect of all other currencies daily quotations given by the State Bank will apply. These quotations will be displayed on the notice board of the Customs House.

A centralised cell has been created in the Accounts Dept. to reassess the prior entry

INDIAN FOOD PACKER

of entry on which duty has been assessed not paid. The appraiser posted in the Customs Dept. for purposes will attend the work of reassessment.

Marine Products

Exports of marine products in the first quarter of the current financial year registered a 26.8 per cent rise over the figures for the corresponding period last year in terms of quantity and 25.7 per cent in terms of value.

Exports during the period from April to June were 15,562 tonnes valued at Rs 22.86 crores as against 12,276 tonnes valued at Rs 18.17 crores during the corresponding period in the previous year.

Exports far exceeded even those of the corresponding period in 1973 and financial year 1973-74. This year, during the first quarter, only 10,706 tonnes valued at Rs 8.87 crores were exported. Compared with that, the increase was 45.4 per cent in terms of quantity and 43.9 per cent in terms of value.

Japan continued to be the major market, followed by the U.S. Japan bought from India during the period under report 18,888 tonnes worth Rs 14.57 crores; compared to the total exports, this was about 12.8 per cent in terms of quantity and 12.7 per cent in terms of value. Japan purchased 4,084 tonnes valued at Rs 7.9 crores and 5,665 tonnes valued at Rs 9.8 crores during the same quarter of 1974 and 1973 respectively.

Exports on Deferred Payment Terms

In order to simplify the procedure relating to exports on deferred payment terms where (i) the value does not exceed Rs 50 lakhs, (ii) the credit period does not exceed five years for specified types of goods, and (iii) IDBI finance is not required, the Reserve Bank has granted general permission to exporters to make offers abroad and to enter

into negotiations for export of goods or submit tenders provided certain minimum conditions laid down in this regard are satisfied, and to enter into contract provided the contract terms conform to minimum conditions.

Applications are required to be made to the Reserve Bank for post-facto Exchange Control Clearance and to the ECGC for necessary insurance cover within 15 days after the signing of the contract. The Reserve Bank has also granted general permission for issuing bid bonds and performance guarantees.

The procedure in respect of cases not covered by the general permission has been streamlined by making the IDBI the focal point for grant of approvals. Under the revised procedure, the exporters, before they make offers or submit tenders, should submit applications in a composite form to IDBI through their bankers. The applications will be processed by a Working Group consisting of IDBI, Reserve Bank and the ECGC. Exporters and their bankers will be associated with the discussions wherever necessary and package clearance for the offer or bid will be granted by the IDBI. Once such a clearance is given, the exporters could enter into contracts in the event they succeed in their bids, subject only to the provision that they will furnish copies of the contracts together with complete information in the prescribed form to the IDBI, Reserve Bank and ECGC for post-facto approval and grant of financial assistance insurance cover.

Blanket Foreign Exchange Permits

The Government has relaxed regulations relating to the use of blanket foreign exchange permits to travel abroad for export promotion.

Under the revised regulations, visits of representatives or officials of the exporters would be permissible even to such countries

where they have their offices or branches. Hitherto the permits were given for specific destinations.

The regulation in respect of the number of persons who can accompany the chief executive of the exporting company has been relaxed. It would now be possible for the chief executive of export company to take along with him either a technical adviser or a financial adviser. Both the advisers may travel simultaneously, if only two persons are going on a sales promotion drive.

The Reserve Bank has now decided to delegate powers to their regional offices to dispose of requests from representatives of manufacturing units to travel under blanket permits issued to export houses after obtaining a certificate from the export house concerned that the manufacturing unit would canalise its entire range of products through the former, before allowing the facility.

The Bank has also advised the officers in charge of their regional offices to dispose of personally the issue or renewal of blanket permits or the issue of *ad hoc* supplementary permits in the interval between the expiry of the permits and their renewal.

Trade Development Authority

The Trade Development Authority of India, Bank of Baroda Building, 16, Parliament Street, New Delhi-1, has established contact with the Canadian Executive Service Overseas (CESO). Exporters are advised to contact Director for CESO's Programme in India, Canadian Executive Service Overseas, Q-1, Hauz Khas Enclave (Annexe), New Delhi-16.

CESO is a non-profit corporation operated by Canadian business leaders with the support of the Canadian Government through its international Development Agency.

CESO helps organizations improve the effectiveness of their production, marketing

and financial management by recruiting senior Canadian administrative and technical consultants with records of achievement. These consultants go abroad and work with existing management in government or business organisations. On request they work without salary in these enterprises in a mutual effort to promote efficiency and productivity. CESO matches the known skills of the consultant with the stated needs of applicant organisations abroad and despatches the consultant, properly prepared to work effectively in the environment of his assignment for periods up to six months.

CESO helps private and government enterprises except companies whose foreign ownership control is in excess of 15 per cent by providing technical or managerial guidance and advice such as improving an established operation, assisting with training programmes, making a feasibility study.

CESO has provided consultants or advisers in the Manufacturing, Agriculture and Fishing, Banking, Construction, Transportation and Communication, Chemicals, Management, Accounting and Finance, Textiles, Pulp and Paper, Merchandising and Marketing and Insurance field.

The user organization provides accommodation satisfactory to the consultant and his wife and pays for their accommodation, meals, incidental expenses and any other costs incurred in connection with his work for the duration of the assignment. No foreign exchange is required.

Necessary office accommodation and services, and a car for all local transportation, are to be provided.

CESO pays economy class air fare of the man (and his wife if the period of assignment is at least two months) to and from his home and the location where he will work.

No fee or salary is paid to consultants by CESO or the requesting organization.

Foreign News

- *U.K.—TPI—New Advisory Service*
TPI—Fish Processing
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 - *U.S.A.—Coca-Cola in Plastic Container*
 - *UNCTAD—UN Tin Conference*
 - *UNDP*
 - *West Germany—ANUGA (Cologne) 1975*
Co-ordinated Research
 - *Rome—World Sugar Production*
 - *France—Hot Irrigation to help harvest of*
fruits and vegetables
 - *Poland—Banana*
 - *Switzerland—GATT Consultative Group*
 - *Australia—High Protein Biscuit*
 - *Tanzania—Cargo Markings*
Sugar
 - *Kuwait—Visa*
 - *Lebanon—Developments*
 - *Greece—International Fair*
-

U.K.

TPI—New Advisory Service

The Tropical Products Institute has set up a 'Rural Food Technology Advisory Group' (RuFTAG) with the collaboration of the Intermediate Technology Development Group Ltd. (ITDG) and other interested parties. This Group will seek to identify the needs of developing countries for food handling and processing methods and equipment, suited for operation at the rural level; also to encourage the filling of any gaps found either in the supply of information to developing countries about existing technologies or in the work going on to develop new 'appropriate' technologies. As

one step in this direction TPI is about to start publishing a series of 'Rural Technology Studies'. In these well-illustrated booklets, operational and constructional details of devices which can be useful in the handling and processing of plant and animal products at the farmer or village level will be provided.

RuFTAG seeks the assistance of interested organisations and individuals who can contribute personal knowledge and experience of the village environment in less developed countries and the needs that exist there.

The address to write to is: Tropical Products Institute, Industrial Development Department, Culham, Abingdon, Oxon OX14 3DA. Attention Dr D. A. V. Dendy.

TPI—Fish Processing

Two projects concerned with fish preservation at Lake Malawi have been making considerable use of TPI's technological skills. Following a request from the Malawi Government in 1972, small a fully equipped laboratory was set up by TPI at Namiasi by the lake with funds provided by the Special Commonwealth African Assistance Plan (SCAAP). Two staff members have been visiting the laboratory to maintain investigations into the use of ice and drying procedures for fish preservation. The second scheme, on a larger scale, is the FAO's fisheries development project, part of which is also at Namiasi and which includes as part of its equipment an ice plant and vehicles to distribute the fish to urban centres. John Disney, head of the TPI's Fish and Meat Section, returned from an 18-month visit on assignment to the FAO. His place has now been taken in Malawi by another member of the section, John Rogers.

In the past few years, much research has been carried out by TPI scientists into the use of ice to preserve fish, and has resulted in the interesting discovery of great practical significance, that the fish caught in tropical waters will keep fresh in ice much longer than fish taken from temperate waters. This means that fish boxed and then packed in ice can be distributed widely in the period of its freshness which may last up to three weeks. This valuable commodity can thus be made available to a wide proportion of the population. Both the TPI and FAO projects aim therefore to encourage the use of ice with the catch from trawling—a method of fishing only recently introduced at Lake Malawi.

At present most of the fish is sun-dried and among the drawbacks of this method is that effective sun-drying is not possible for 3 or 4 months of the year during the rainy season. TPI scientists have carried out considerable research into drying. Mechanical drying using a Japanese machine has been tested but the economics of this method are not altogether encouraging.

One of the best examples of the excellent results possible with co-operation between the national government, the FAO and TPI is the introduction of a new product—a lightly smoked kampango fish, with a flavour similar to that of smoked haddock. The technique was developed at the TPI's London laboratory in 1972, put into effect and further developed at the Namiasi laboratory in 1973, and the smoked fish was then produced on a pilot scale as part of the FAO project in 1974.

Over the past years the work of TPI has progressed logically from basic initial research into bacteriology—assessing the spoilage rates etc. to practical commercial application of research results. It is planned to assess the economic implications of using ice. The work at Namiasi has aroused considerable interest in other quarters and

there is a strong possibility that a similar laboratory will be set up in another country before long.

1-Week Course on Canning Machinery

Following the success of its 'in depth' courses in specialised packaging subjects, The Institute of Packaging has now published the curriculum for another new Course in its programme.

Packaging Machinery is a one-week residential course to be held at The Postal Management College, Coton, near Rugby, from 23rd-28th November 1975.

Arrangements for the Course have been made in collaboration with the Packaging Machinery Section of the Process Plant Association, and the programme will be co-ordinated by Mr H. T. File, formerly Special Project Engineer with Aspro-Nicholas Ltd.

The objective of the Course is to provide an appreciation of the packaging engineering function the range of machinery available for the packaging of different products and using different packaging materials and the contribution to overall economy made by mechanisation.

The curriculum has been designed to benefit production managers, package development managers, process plant engineers, work study engineers, package machinery designers, material suppliers and other senior personnel whose executive decisions can affect, or be affected by, the effective and economical operation of semi- or fully-automated packaging processes. Such personnel will be expected to have basic understanding of the underlying engineering principle and factory layout procedures involved.

It is intended that the lecture programme shall include sessions on the selection, installation and maintenance of packaging machinery; mechanical handling of the product;

canning machinery; mechanical handling of rigid containers; cartoning, labelling, closing and sealing equipment; form, fill and seal machinery; wrapping machines; check-weighing; preparation for despatch; and future trends in automated processes.

The fee, inclusive of accommodation, meals, lecture material, etc., is £120 for individual members of the Institute of Packaging and £130 for non-members.

The closing date for company nominations is Friday, 31st October 1975, and these must be made on the appropriate form obtainable from the Education and Training Officer, The Institute of Packaging, Fountain House, IA Elm Park, Stanmore, Middlesex HA7 4BZ.

U.S.A.

Coca-Cola in Plastic Container

A recyclable plastic bottle for carbonated beverages, developed by Monsanto Company, is being adopted by Coca-Cola, for market introduction.

Promoted by Coca-Cola as 'Easy-Goer' and trade mark by Monsanto as Cycle-Safe, the nitrile polymer container is made by a process known as Molecular Orientation which involves the alignment of molecules into layers, much like the principle of inflating a balloon.

Coca-Cola will be available in 10, 16, 32 and 48 oz. sizes with resealable aluminium closures. With the growing trend of larger size containers, Cycle-Safe's light weight becomes a substantial factor in handling, both for the consumer and the bottler. It also increases the storage capacity by about 15 per cent. The flexible nature of the container resists breaking at high impact when dropped, and if breakage does occur, the pieces are larger and unlikely to cut.

Cycle-Safe protects beverage taste, holds carbonation and does not react with the product, even after long shelf storage.

UNCTAD

UN Tin Conference

The Secretary-General of UNCTAD, at the request of the International Tin Council, has invited all UNCTAD member-states to negotiate a fifth International Tin Agreement to come into effect on July 1, 1976. The tin producing countries which are members of the Agreement are Australia, Bolivia, Indonesia, Malaysia, Nigeria, Thailand and Zaire. The consuming countries are Austria, Belgium/Luxembourg, Bulgaria, Canada, Czechoslovakia, Denmark, France, Federal Republic of Germany, Hungary, India, Ireland, Italy, Japan, Netherland, Poland, Republic of Korea, Romania, Spain, Turkey, the U.K., the U.S.S.R. and Yugoslavia. The European Economic Community also participates in the fourth Agreement as an inter-governmental organisation.

The main objectives of the Tin Agreement are to prevent excessive fluctuations in the price of tin, to help increase the export earnings from tin, and help secure an adequate supply of tin at prices fair to consumers and remunerative to producers. The main issue for the Conference is whether to enlarge substantially the current tin buffer stock and to improve the arrangements for financing it. Pricing policy will also be considered. The UNCTAD Secretary-General has suggested the inclusion of certain new elements, namely, measures to promote the further expansion of the processing of tin in developing countries, provision for the joint financing by producing and consuming countries of research to promote the consumption of tin, and for multilateral commitments concerning purchases and supplies.

An UNCTAD paper entitled, *Some Policy Issues in the Preparation of an International Tin Agreement*, outlines and comments on various policy issues, the main one being that of substantially enlarging

the size of the tin buffer stock and making satisfactory financing arrangements for it. Other issues discussed in this paper include non-commercial stockpiles, price objective, and the inclusion of certain new elements in a fifth International Tin Agreement.

UNDP

The littoral states of the Persian Gulf held a conference in Doha on the 9th April, 1975, to launch a survey of fisheries and to chalk out a development programme for increasing the catch. This project, costing more than 7 million dollars, is being sponsored by the UNDP. At present, the study is being primarily directed towards identifying the types of fish available in the Arabian Gulf and the Sea of Oman and assess their annual potential.

WEST GERMANY

ANUGA (Cologne) 1975

The 1975 Cologne ANUGA fair (September 13 to 18) will be opened by Helmut Schmidt, the Federal Chancellor, on September 13, 1975. ANUGA (Cologne) is the world's biggest market for food and catering systems. The opening ceremony will be attended by a large number of ministers, secretaries of state and ambassadors from many countries.

3,000 firms and organisations from 70 countries will take part in ANUGA (Cologne) 1975. More than 50 per cent firms at the fair will be from foreign countries. India's participation in International Fair has enabled it to book spot orders resulting in continuous orders.

Organised by the Cologne Fairs once in two years, ANUGA is the world's most important trade fair for foods and provisions. The Fair has been replanned and re-organised to cater for separate sectors with more marked grouping by sections and symbols designating all exhibition stands (trade, major consumers, restaurant

services, skilled trade in the food branch/industry). There is also the computer service facility for buyers, furnishing appropriate lists of exhibitors for the articles one seeks.

A large number of firms dealing in pickles, sauces, curry pastes, canned fruits, fruit juices and pulps, dehydrated banana powder, dehydrated vegetables, Indian sweets, mango slices and pulp, papads, walnut kernels, dried mushrooms, peanut candy, drinking chocolate, and custard powder will participate. Marine Products Development Authority, Cashew Export Promotion Council, the Spices Export Promotion Council and the Cardamom Board will organise participation in ANUGA.

Co-ordinated Research

An extension of the agreement between the International Atomic Energy Agency (IAEA) and the Gesellschaft für Strahlen- und Umweltforschung GmbH (GSF) (Radiation and Environmental Research Organization), Munich, on a joint programme for co-ordinated research to improve protein content and quality of crops by nuclear techniques was signed recently by the Director-General of the IAEA, Dr Sigvard Eklund and Dr Rudolf Wittenzellner and Mr Herman Costa of the GSF. The extension is based on the Agreement of 3 May 1971 which involved an amount of more than US \$800,000 and will end on 31 December 1975.

During the current period of the programme, there have been a number of examples where the protein content or protein quality of crops has been altered by mutation induction and a number of much improved analytical methods have emerged from these studies.

The extension is to test the usefulness of these methods, to find new mutants and further improve analytical methods for the

plant breeders. For 1976 to 1978, the Federal Republic of Germany has agreed to extend its support to the programme through GSF for an equivalent of roughly one million dollars. The extended support will assist plant breeders in developing countries in their quest for crops which have superior nutritive value as well as high yielding potential. The development of improved breeding and selection techniques is seen as an important need in accomplishing these tasks.

ROME

World Sugar Production

Sugar production, which reached a record total of 80 million tons in 1973-74, was

divided between cane and beet in proportions of about 60 per cent for the former and 40 per cent for the latter. Since the 1974 beet harvest was particularly bad in the northern hemisphere, it is expected that total sugar production will be lower in 1974-75 than during the preceding season and the percentage of cane sugar will be further increased.

As the table shows, since the beginning of the 1970s, production has been inadequate to meet consumption, and stocks have been reduced each year. At the end of August 1974, they were equivalent to 10 weeks' consumption only against 16 weeks' 4 years before. Since then the situation has worsened.

	(Millions of tons of centrifugalized sugar)					
	Average 1966-70	1970	1971	1972	(estimated figures)	
					1973	1974
<i>Production¹</i>						
World Total	66.65	72.66	72.13	72.13	72.27	79.82
Developed countries	19.60	20.81	20.63	23.23	22.97	22.45
Developing countries	30.45	35.60	34.58	32.89	36.50	39.34
Centrally planned countries	16.60	16.25	16.92	16.01	16.80	18.03
<i>Consumption²</i>						
World Total	64.74	70.55	73.22	75.02	77.50	80.00
Developed countries	27.81	29.49	29.98	30.46	31.50	31.80
Developing countries	20.60	23.24	24.92	25.59	26.35	28.20
Centrally planned countries	16.33	17.82	18.33	18.98	19.61	20.00
<i>Stocks carried over¹</i>						
World Total	19.9	21.4	19.0	17.1	15.8	15.6
<i>Exports</i>						
World Total	20.33	22.27	21.68	22.56	23.23	—
Developed countries	4.24	4.58	4.79	6.28	5.95	—
Developing countries	12.89	15.13	14.46	14.65	15.82	—
Centrally planned countries	3.20	2.57	2.36	1.62	1.53	—
<i>Imports</i>						
World Total	20.12	22.41	21.40	21.94	23.33	—
Developed countries	12.26	13.09	13.21	13.73	13.24	—
Developing countries	4.16	4.19	4.54	4.42	5.43	—
Centrally planned countries	3.70	5.13	3.65	3.79	4.66	—

¹ Season finishing the year indicated; ² Excluding non-food consumption.

Latin America heads the list of producing regions with some 24.5 million tons in 1974, or about as all the developed countries together. It is followed by the EEC, the U.S.S.R., and the developing countries of the Far East and Oceania, the production of each of these three 'big seconds' amounting to between 9 and 10 million tons in 1974. Then comes North America with 5-6 million tons and the developed sugarcane producing countries (Australia and South Africa), and Eastern Europe and China with a little more than 4 millions each. The rest of the world produce 8 million tons.

The big exporters are mainly developing countries, which produce far more than they consume. Their margin available for export seems to be expanding again, particularly in Brazil. The developed countries have also, in recent years, increased their production and their consumption. They were dependent upon net imports for about 23 per cent of their needs in 1973, as against 29 per cent in 1966-70.

Countries with centrally planned economies have experienced, with nearly 17 per cent, the biggest increase in consumption during the same period. Whereas they were self-sufficient in 1966-70, they have become important net importers in recent years.

For a long time, numerous developing countries have benefited from special trade arrangements, which assured them markets for their sugar at favourable prices, particularly in the United States, the United Kingdom and the U.S.S.R. In 1974, the rise in prices on the world market put these arrangements under severe strain and the United States' Sugar Act, after forty years of existence, has not been renewed. The EEC is at present negotiating with Third World countries which, until now, supplied the United Kingdom under the terms of the Commonwealth Sugar Agreement.

The value of world exports rose from US \$ 2067 million in 1966-70 to about

\$ 4630 million in 1973, an increase of 125 per cent as compared with an increase of only 14 per cent in volume. World prices had begun decreasing again from a peak of £ 650 a ton cif United Kingdom at the end of November 1974.

FRANCE

Hot Irrigation to help harvest of fruits and vegetables

Just as plants and flowers are artificially bred in hot houses, advancing the harvests of fruits and vegetables grown in the open by using hot water irrigation is being studied. Interesting experiments, concerning the utilisation of hot water discharged by nuclear power stations to hasten the growth of plants and fish, have been going on. The Cadarache Nuclear Research Centre, France, is currently carrying out research in this area with hot water from a pressurized water reactor at its Continental Radioecology Laboratory. It has succeeded in advancing the harvest of a number of agricultural products. For example, despite very unfavourable weather during spring, strawberries ripened three weeks earlier than usual; potatoes matured five weeks early and asparagus as much as two months early.

Field experiments are being carried out with maize and soya beans, the cultivation of which poses problems of resistance to bad weather.

The importance of the research at Cadarache is that the basic technique of warm water utilisation can be applied in different ways:

- soil can be heated by means of buried pipes;
- irrigation can be carried out by sprinklers or perforated pipes;
- a combination of soil heating and irrigation is possible from furrows between the planted areas.

This last method appears to be particularly promising as a means of achieving higher yields in forestry.

Ecologists at Cadarache are also studying ways of achieving higher yields in pisciculture by eliminating the inactive winter period of fish. Encouraging results have been obtained with eels reared in water kept at a steady 13°.

In Japan, a very successful fish-farming industry has been developed by using water discharged from the Tokai Atomic Power Plant, north of Tokyo, which discharges its thermal waters into the Pacific Ocean. Culturing ponds have been constructed on a commercial enterprise to raise fish. The annual fish production target is 50,000 bream, 50,000 abalone and 1,00,000 prawns. The culturing ponds are in so-called 'secondary' water, which is completely free of any radioactivity, and continues to be carefully monitored before discharge into the ocean.

Japan has long been a leader in making commercial use of thermal discharge waters. For many years, lobsters have been raised in artificially warm waste waters from fossil fuel power plants.

Canadian and United States enterprises are likewise interested in the commercial exploitation of this artificially warmed water for their fishing industries.

With everybody complaining about the natural vagaries of the weather, controlled agricultural production by utilising 'waste' hot water may ensure a regular supply of some of the more climate-susceptible food-stuffs.

POLAND

Banana

Bananas are very much liked by the Poles and are in great demand in Poland. At present, Poland imports bananas from Panama, Ecuador and Colombia. In order to explore the possibility of exporting bananas from India to Poland, the Polish

Foreign Trade Enterprise, 'M/s AGROS', Zurawia 32/34, Warsaw, who are responsible for the import of bananas into Poland, are agreeable to import fresh bananas from India, provided good quality is assured and delivery schedules are maintained.

Fresh Vegetables: Poland, which is an extremely cold country, depends on countries like Bulgaria, Hungary for fresh vegetables. Fresh tomatoes are imported from Egypt in wooden crates by air.

Butter and Meat: The supply of butter and meat in the home market is meagre and it has become difficult to get these essential items of food.

SWITZERLAND

GATT Consultative Group

The GATT Council decided recently to establish a Consultative Group of Eighteen. The Consultative Group's membership will consist of 18 high-level representatives nominated by governments, which have been so chosen as to provide a balanced and broad representation of the membership of GATT itself.

The group's purpose is 'to facilitate the carrying out of GATT responsibilities with respect to:

- (a) following international trade developments with a view to the pursuit and maintenance of trade policies consistent with the objectives and principles of the General Agreement;
- (b) the forestalling, whenever possible, of sudden disturbances that could represent a threat to the multilateral trading system and to international trade relations generally, and action to deal with such disturbances if they in fact occur; and
- (c) the international adjustment process and the co-ordination, in this context, between the GATT and the International Monetary Fund'.

The Council's decision will be reviewed after one year. It follows intensive consultations among all the member countries of GATT, and is based on a proposal originally submitted by the Director-General of GATT, Mr Olivier Long, in June 1974.

AUSTRALIA

High Protein Biscuit

A high protein milk biscuit has been developed and manufactured to supplement low nutritional diets. The Australian Government's Commonwealth Scientific and Industrial Research Organization (CSIRO) and Arnotts Biscuits Pty. Ltd. began joint research into the biscuit nearly 10 years ago.

They wanted to produce a high protein milk food product combining the nutritive qualities of milk with the convenience of biscuits. It also needed lasting qualities, portability, and to store without deterioration, yet be ready for immediate consumption without cooking or combining with other ingredients.

The key was the use of co-precipitated milk proteins which retain 96 per cent of proteins in dried milk with a minimum loss of nutritional value. A lactose-free product, it overcomes lactose intolerance found in many people in Asia and Africa.

Four 10g biscuits provide the protein equivalent of half a pint of milk and the recommended daily allowance of essential vitamins and minerals. Acceptability tests were carried out successfully in Zambia, Ghana, Kenya, Indonesia, Thailand, Malaysia, Fiji, Papua New Guinea and Australia.

Tests in Papua New Guinea, where the biscuit is marketed commercially, showed it increased the height and weight of children. In Indonesia, it was found that children enjoyed the biscuits and there was a fall in school absenteeism from sickness.

The Government of Zambia imports the biscuits for the commercial market and to

develop a school programme. The Australian Government provided a pilot biscuit making plant to help establish local production.

Ingredients in the biscuit are flexible to allow for local products. Wheat flour and butter oil are used in Australia. Elsewhere, maize meal, oats and rice flour can substitute for wheat flour, and coconut oil can replace butter oil.

Trade inquiries: Arnotts Biscuits Pty. Ltd., Overseas Trading, 170 Kent Street, Sydney, New South Wales, Australia 2000.

TANZANIA

Cargo Markings

The Port Authority, Dar es Salaam, has introduced a system of distinctive colour marking of cargo for discharge at Dar es Salaam. The colours are as follows:

<i>Destination</i>	<i>Symbol</i>
Tanzania	... Red
Zambia	... Green
Zaire	... Blue
Rwanda	... Yellow
Burundi	... Black

It is the responsibility of shippers to ensure that packages are correctly colour-marked in the following manner.

In order to avoid any confusion with the marking modes adopted by certain organisations using the port, a cross must be used for this colour marking on the same side of goods as marks and numbers. Depending on the size and/or length of the package the cross should be large enough to be 'visible from a distance'. For 'normal packages' the arms of the cross should not be less than 30 cm/1 ft. long.

It is stressed that the introduction of the above colour marking system is not intended in any way to replace the normal marks and numbers and other details of the consignee, but shippers/suppliers are urged to avoid or

reduce as far as possible unnecessary advertisements, wording etc. on packages.

This system will affect all cargoes loaded at foreign ports on or after 1st January 1975. The Port Authority at Dar es Salaam stress that they can accept no responsibility for loss of packages which are not colour marked or are incorrectly marked, reserving the right to levy sorting charges (as yet unspecified) as necessary.

Sugar

Agriculture occupies an important place in the economy of Tanzania. Over 90 per cent of the population live in the rural zones where agricultural activities are the main source of employment. Four big plantations are producing sugar. The new project will create a fifth with a refinery and related facilities. The company in charge of the project will be the Kilombero Sugar Company (KSC). The existing professional training programmes will be upgraded to meet the new situation. Thus, it is hoped that production of refined sugar will be increased by 45,000 tons, which will bring in \$ 14 million net per annum. As to the outgrower ujamaa families, their annual income should reach \$ 275 by the second year and \$ 725 at the end of the sixth.

Investment: \$ 55.8 million (Tanzania: 9.5; World Bank: 9; IDA: 9; Danish Government: 17.3; Dutch Government: 11).

KUWAIT

Visa

Businessmen visiting Kuwait have faced difficulties in obtaining visa. Such difficulties will not arise if those planning to visit Kuwait produce letters to the effect from either the concerned Export Promotion Council or a Chamber of Commerce of which his firm is a member while applying for visa. If the traveller still face any difficulty after producing such a document he is advised to approach the Ministry of

External Affairs, Government of India, Post Box 1450, Kuwait.

LEBANON

Developments

Joint ventures have been recognised in Lebanon and throughout the Arab World, as a practical method for industrialisation and diversification of the industrial structure.

Owing to the free economy and free enterprise system, joint ventures in Lebanon had to be negotiated between the Lebanese industrialists/promoters and foreign entrepreneurs. Negotiations of foreign parties with the Lebanese Government are confined to Government owned or Government controlled projects.

Lebanon is one of the industrialised countries in the Middle East. Industry accounts for around 20 per cent of national income and provides employment for 72,000 workers. Light industry dominates Lebanon's industrial structure, especially food processing, beverages and others.

Raw materials available in Lebanon could be divided into four categories, namely (a) Animal origin, (b) Plant origin, (c) Mineral origin and (d) Chemicals.

Measures to protect and encourage industries take the form of (a) Fiscal Exemptions; (b) Customs Duties Exemption on raw materials and reduced duties on semi-manufactured primary materials and imported machinery; (c) Special Tariffs/Rates for electric power consumed in industry, fuel oil and gas, low taxes on transport vehicles, working for and owned by industrial establishments, low customs duties on most Lebanese manufactured or produced goods, by Arab importing countries in conformity with economic bilateral agreements; (d) Government tenders awarded to tenderer, offering Lebanese manufactured goods even if prices are upto 10 per cent higher than similar (in function and quality) to foreign goods offered by competitive tend-

erers, subsidies granted to some industries on exporting their manufactures, free transfer of capital and profits from Lebanon to any foreign country; and (e) Free zone regulations allow factories located in free zone—a total exemption from customs duties on material imported to be manufactured for re-export.

Those wishing to start industrial projects in Lebanon must obtain work and residence permits from Ministry of Labour and Social Affairs and Public Security Directorate, respectively.

In Joint Stock Companies (SAL), it is legally required that a majority of the Board of Directors should be of Lebanese nationality. In all other respects Lebanese and foreigners stand equally alike in treatment and responsibilities before Lebanese law and regulations.

Specialists, experts, technicians who cannot be replaced by Lebanese are allowed to be employed in Lebanese industry, by special permits issued by the Ministry of Labour and Social Affairs.

A 5-day Industrial Promotion Conference was organised by UNIDO and the Government of Lebanon from 19th June to 23rd June 1972 at Beirut. The purpose of this conference was to bring together potential foreign investors, suppliers of technical know-how and equipment and Lebanese proponents of industrial projects selected by the Lebanese Ministry of Industry, in co-operation with the UNIDO for the implementation of such projects in Lebanon.

44 selected industrial projects covering wide range of manufacture were selected at the meeting, including fruit and vegetable products, vegetable dehydration, fruit dehydration, egg dehydration, baby foods, apple products, sugar and animal feed.

GREECE

International Fair

Foire Internationale de Thessaloniki will organise International Fair of Foods, Beverages and Machines in Athens from 4-11 April 1976.

Exhibits include foods and beverages, machines for food and beverage industries, chemical products for industrial foods and beverages, and food-shops equipment. This Fair offers to the exhibitors, food buyers, food manufacturers, craftsmen, and supermarket owners the opportunity to investigate the Greek and international markets of foods, beverages and relative machines and to be informed about the new techniques and methods of packing, standardising, forwarding and distributing products and to study the new programmes of organising and communication. Rent per stand of 16 sq. m. with one face is Drs. 12.000 equipped with decoration. 10 per cent extra for every additional face.

More details be had from Miss Helan Lazaridou or Dr Rigas D Tzelepoglou, Foire Internationale de Thessaloniki, Republique Hellenique, Thessalonike 29, Athens 5604, Greece.

Trade Marks

(Trade Marks accepted by the Trade Marks Registry)

No.	Name and address of applicant	No. and Date of the Trade Marks Journal publishing the Trade Mark	Official No. of Trade Mark	Date	Products	Trade Mark
M/s						
1.	Oceanic Dehydrates Pvt. Ltd., Bedeshwar, P.O. Box 31, Jamnagar	625/16-6-1975	292,765B	12-12-1973	Preserved, canned and dehydrated food products included in class 29	Amal (Class 29)
2.	Sardar Jagjit Singh and Bros., 307, Kharek Bazar, Masjid Bunder, Bombay 9	625/16-6-1975	294,351	19-2-1974	Preserved, dried and cooked fruits and vegetables	CHADHA (Class 29)
3.	Kaira District Co-operative Milk Producers' Union Limited, Anand, Gujarat State	625/16-6-1975	298,680	26-8-1974	Milk based beverages included in class 30 and cereal preparations for food for human consumption	Balamul (Class 30)
4.	Anil Vasant Heble, 'Vishal' Building, ST Inez, Panjim, Goa	626/1-7-1975	301,594	21-12-1974	Fish and fish products included in class 29	Smokiemag (Class 29)
5.	Weikfield Products Co. (India) Pvt. Ltd., Weikfield House, 116, Koregaon Park, Poona 1	626/1-7-1975	277,879	28-1-1972	Custard powder, corn flour (flavoured and unflavoured), baking powder, jelly crystals, common salts, black pepper, vanilla essence in powder form for edible purposes, gelatine for foods for human consumption, blanc mange powder, processed spices included in class 30, cake and pudding mixes, ice-cream mixes, arrow-root powder, glucose (for food), sago and barley, drinking chocolate included in class 30	Weikfield (Class 30)
6.	Mohan Meakin Breweries Limited, Solan Brewery P. O., Simla Hills, Himachal Pradesh	626/1-7-1975	285,869	7-2-1973	Fruit beverage (non-alcoholic)	'Fruit Punch' (Class 32)
7.	Standard Oil Company, 30 Rockefeller Plaza, New York	627/16-7-1975	275,870	29-10-1971	Meat, fish (not alive), poultry (not alive) and game (dead), preserved, dried and cooked fruits and vegetables, edible oils and fats, preserves (vegetable and fruit)	EXXON (Class 29)

Sl. No.	Name and address of applicant	No. and Date of the Trade Marks Journal publishing the Trade Mark	Official No. of Trade Mark	Date	Products	Trade Mark
8.	Goa Food Products Private Limited, Chowgule House, Mormugao Harbour, Goa	627/16-7-1975	284,525	5-12-1972	Non-alcoholic drinks and non-alcoholic beverages, fruit squashes, and fruit juices and syrups and other preparations for making beverages included in class 32	PRINCE (Class 32)
9.	Standard Oil Company, 30 Rockefeller Plaza, New York	628/1-8-1975	275,908	29-10-1971	Meat, fish (not alive), poultry (not alive) and game (dead), preserved, dried and cooked fruits and vegetables, edible oils and fats, preserves (fruits and vegetables)	EXXON (Class 29)
10.	Weikfield Products Co. (India) Private Ltd., Weikfield House, Post Box No. 25, 116, Koregaon Park, Poona 1	628/1-8-1975	277,844	25-1-1972	Custard powder, corn flour (flavoured or unflavoured), baking powder, jelly crystals, common salt, black pepper, vanilla essence in powder form for edible purposes, gelatine for foods for human consumption, blancmange powder, processed spices included in class 30; cake and pudding mixes, ice-cream mixes, arrowroot powder, glucose (for food), sago and barley, drinking chocolate included in class 30	Weikfield (Class 30)

Government Notifications

- *Provisional fixation of drawback rates/amounts pending determination of the rate of drawback*
 - *Fixation of Drawback Brand Rates*
 - *Tax Concession for R and D Activities*
-

Provisional fixation of drawback rates/amounts pending determination of the rate of drawback

All exporters who desire to have provisional rates of drawback are required to file a separate application for provisional rates if they want one to be fixed and furnish information in the enclosed proforma in triplicate.

The exporter may also be advised to indicate prominently in the covering letter that the applicant is for fixation of a provisional rate and give clear reasons for the anticipated delay in the final settlement of the rate and why they want to have provisional rate.

Those exporters whose earlier applications for provisional rates are pending may please again repeat their requests in this proforma.

Requests for provisional rates will generally be allowed only in cases where delay is anticipated in fixation of final rates and the drawback amount involved is substantial.

Application for Fixation of Provisional Rates

1. Name and full address of the Manufacturer/Exporter.
2. Name and full address of the factory where the goods exported or to be exported are being manufactured.

3. Full description of the export product as per exporter's documents.
4. Date of application with date to the Collector concerned and Ministry and reference number and date under which application was acknowledged by Collector/Ministry.
5. Total quantity and FOB export value for which provisional rate fixation is requested. If the exports are yet to take place, then the quantity and the FOB value to be exported and for which the provisional fixation of rates is requested may be indicated.
6. Whether there was any rates of drawback already available for the particular goods and if the validity period has expired, Ministry's letter number and date and drawback rates may be indicated.
7. Provisional rate and/or amount of drawback claimed and the basis thereof (Necessary supporting data may be enclosed).
8. Percentage of the rate of drawback claimed on FOB value per unit of export product.

(Notification No. F. No. 602/19/71-DBK, dated the 4th May 1975).

Fixation of Drawback Brand Rates

The Ministry is making every effort to see that the drawback rates are worked out as quickly as possible and with reasonable accuracy. In this connection, it is felt that it would be useful if all the exporters who apply for fixation of drawback brand rates furnish the following information alongwith their application in the prescribed proforma and statements Drawback I to III:

1. Rate of drawback that they expect on their export goods;
2. Major raw materials and components alone which account for a substantial portion of the duty drawback (under this head, only those raw materials or components which contribute more than 10 per cent to the total drawback need be included; and
3. In respect of imported items or indigenous excisable items bought from the market the duty paying documents such as Bills of Entry or Manufacturers' Invoice showing separately the amount of Central Excise duty paid may not be available with the exporters. In such cases exporters may as far as possible ascertain the normal assessable value and duty incidence and give this information in their statements.

(Notification No. F. 602/17/75-DBK, dated the 2nd May 1975).

Tax Concession for R & D Activities

The Govt. of India has relaxed Income Tax Act 1961 giving concession of Research and Development expenditure incurred by companies.

(1) Under Section 35 (i) and (iv) read with Section 32(2) heretofore capital expenditure on scientific research is fully allowed for deduction in which it is incurred. Capital expenditure during the 3 years immediately preceding the commencement of business is also allowed for deduction.

The whole of revenue expenditure on scientific research is allowed as a deduction in the year in which it is incurred. The revenue expenditure with regard to payment

of salaries of research personnel, materials inputs of scientific research for 3 years immediately preceding the commencement of business is allowed to be written against the profits. This expenditure to be certified by the authority concerned viz. (i) Indian Council of Agricultural Research; (ii) Indian Council of Medical Research; (iii) Indian Council of Social Sciences and/or (iv) The Secretary, Dept. of Science and Technology, Govt. of India.

(2) Under section 35 (2A), amount spent on approved research and development programmes sponsored by the company or an approved laboratory/institution, for one-third of the amount paid, approved has to be obtained from the concerned authority.

(3) Under section 35 (1) (ii), the amount paid to approved scientific association having scientific research as its objective, approved institutions, colleges or universities for any scientific research, which need not relate to the business carried out by the payer.

Approval of the scientific association or research foundation and other institutions for this purpose has to be obtained from the Central Board of Direct Taxes, Ministry of Finance, Govt. of India, New Delhi.

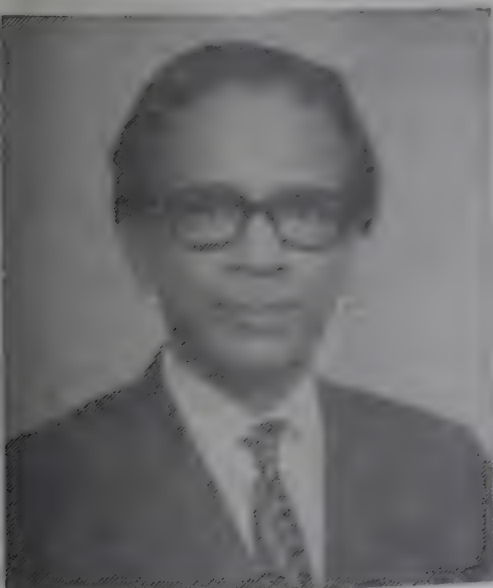
(4) Under section 80 MM, tax is deductible up to 40 per cent for incomes received by way of royalty/commission for providing technical know-how provided the technical service has been undertaken by an agent approved by the Government.

Under section 80-O, the entire income deductible received by the Indian company or person who is resident in India, from a foreign company, Government for providing the invention, model, design, secret formula or process for industrial, commercial or scientific know-how.

and Companies

N. K. Roy
Narendra Dharmsinh Desai
Om Prakash Dang
M. Mahadeviah
O. P. Bosh
M. V. Sastry
Bhupinder Kaur
Urmil Bandra
Nathi Gurdeep Kaur
E. M. Verbeek-Inckel
ian Institute of Foreign Trade
a Oil Mills Co. Ltd. Bombay
Metal Box Company of India Ltd
omatic Cartoning Machine
dustan Lever Limited
sha Industrial Co. Ltd
de Development Authority
e Food Corporation of India
India Fisheries
vertising Club, Bombay

N. K. Roy



ri N. K. Roy retired from the Board
itannia Biscuit Company Limited in

March 1975. He served the organisation for more than 27 years and was its Executive Director for almost 15 years.

Shri Roy, M.A. (Econ.), LL.B., F.C.M.A. (London), F.I.C.W.A., was in charge of planning, diversification, personnel and finance of the Company. He was on the governing bodies of Institute of Cost and Works Accountants; the Calcutta Productivity Council and the Calcutta Management Association.

Shri Roy was a member of Executive Committee, Federation of Biscuit Manufacturers of India for 11 years and was its President from 1972 to March 1975.

Dr Narendra Dharmsinh Desai



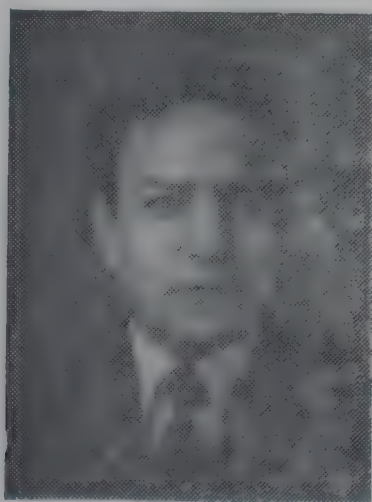
Dr Narendra Dharmsinh Desai has been elected to the Executive Committee of All India Food Processors' Association at the annual general meeting held in New Delhi on 24-25 April 1975.

Dr Desai is the Managing Director, Apar Pvt Ltd. (Saras Foods), Bombay. Born on May 22, 1940, he did B.Sc. Hons. (1961) in London, M.S. in E.E. (1962) and Ph.D. in Electrical Engineering (1964), both from U.S.A.

Dr Desai has travelled extensively abroad visiting engineering industries and educational institutions. He is the Director, Hindustan Conductors Pvt. Ltd., Baroda; Cema Pvt. Ltd., Nadiad; Dharmsinh Agricultural Research and Development Foundation (P) Ltd., and Dharmsinh Industrial Research Foundation (P) Ltd. Dr Desai is a trustee, D.D. Education Trust; D.D. Foundation; Dharmsinh Desai Trust and The Friends of Gujarat Trust.

Dr Desai is Member, Executive Committee, Indian Electrical Manufacturers' Association and Chairman, Cables and Wire Panel of the Association; Associate Member of the Society of the Sigma XI, Pennsylvania, U.S.A. and is in the Special Committee, DGTD, for distribution of EC grade aluminium.

Shri Om Prakash Dang



Shri O. P. Dang is the Chief Food Technologist, Mohan Meakin Breweries Ltd., Mohan Nagar, Ghaziabad. He is responsible for the production of Apple juice, Mango Nectar and other fascinating fruit products of the Company and their exports. During his associations with Mohan Meakins, he has introduced products like Bono Syrup and Fruit Punch; the former has earned a great reputation in the foreign markets.

Shri Dang graduated from Punjab University in 1950. He qualified for Post-

graduate Diploma in Fruit Technology from the Central Food Technological Research Institute, Mysore, in 1952.

In a joint venture with his brother, Shri R. L. Dang, he was responsible for starting a fruit preservation factory at Delhi in early fifties. He joined the Directorate of Industries and Commerce, Government of Madhya Pradesh, Indore, in 1954 as In-charge, Fruit Preservation Centre, to do extension work.

In 1956, he joined Govt. Fruit Preservation Laboratory, Punjab, Patiala, where he standardized a number of formulations on the better utilization of fruits such as Bael, Litchi, Mango, Citrus and Temperate Fruits. He did pioneering work on the varietal trials of Indian Peaches and Apricots for their canning. His services were requisitioned by Himachal Pradesh Government, Department of Agriculture, in 1961 as Incharge of Fruit Preservation activities in the State. His main contributions here had been in the field of canning of Sarson-Ka-Sag, utilization of Gola pears, wild peaches, apricots and Rhododendron products.

In 1964, he alternated his services to the industry and was overall Incharge as Food Technologist of a fruit juice plant at Hyderabad. During the initial one year period of installation and commissioning of this plant, he was associated with experts from East Europe and got specialised training in Food Technology and 'Plant Handling'. During his stay here, he introduced new juice blends and cocktails for exports such as Sweet Lime—Banana Cocktail, Grape fruit orange, Cherry Berry Nectar, Banana Ambrosia, Curry Sauces, Guava Juice, Mango Juice and Nectar. The products had high appreciation from U.S.S.R., the major importing country.

The unit was declared as largest exporter of fruit products and placed in the list of 'Export Houses' by Govt. of India. Experimental work on the canning of mushrooms

and development of its products was also done here by him in collaboration with experts from U.S.A.

By and large wherever he has worked his reputation as a Food Technologist had been very high. He has a number of publications to his credit. He is also Adviser and Expert for Selections to Govt. Departments.

Dr M. Mahadeviah



The University of Mysore has conferred the degree of Doctor of Philosophy (Ph.D.) in Food Technology this year to Shri M. Mahadeviah, Scientist, Fruit and Vegetable Technology Discipline, CFTRI, Mysore, for his thesis entitled 'Studies on the corrosion of tinsplate container with some fruit products and their constituents'.

Shri Mahadeviah is a B.Sc. graduate of Mysore University. He has passed the post-graduate associateship course in Fruit Technology at CFTRI, Mysore, during 1962 and secured first class. He has also passed Associateship of Institution of Chemists (AIC), India, during 1965.

After completion of his studies at CFTRI, he joined the Directorate of Marketing and Inspection at Madras as Inspector, Fruit Products, during 1962. In 1963, he worked as Assistant Production Manager,

Nagpur Orange Growers' Association, Nagpur, for a short period. At present, he is working on the project on evaluation and corrosion of tinsplate containers for packing food products. The special emphasis of this project is on the utilization of indigenous tinsplate. He has published a number of research and review papers pertaining to discolouration of fruit and vegetable products, evaluation and corrosion of tinsplate containers with fruit and vegetable products.

Shri Mahadeviah visited East Germany during 1971 under the Exchange Programme with the German Academy of Sciences, Berlin, to study the developments in canning and preservation of fruit and vegetable products. He has also visited West Germany, U.K., France, Switzerland and Italy.

He is the Vice-President of CSIR Scientific Workers Association (CFTRI Branch), Mysore; Councillor, Association of Food Scientists and Technologists (India); Principal member, I.S.I. Sub-Committee on Metal containers.

Shri O. P. Beerh



Shri O. P. Beerh has been promoted as Scientist, C Grade, CFTRI Experiment Station, Ludhiana.

He took his B.Sc. degree from Punjab University and later passed Associateship

course of CFTRI, Mysore, securing first class and a merit scholarship. He had his early factory experience in Choe's Canning Company, Nagpur and Tims Products Ltd., Belgharia.

From 1959 to July 1961, he worked as Incharge, Govt. Community Canning Cum Training centres at Kaupar and Dehra Dun under the Directorate of Fruit Utilisation, U.P. In this capacity he guided various developmental and extension works connected with explicit publicity of protective foods and development of food industries.

He joined CFTRI in 1961 as Junior Scientific Officer. From 1961 to 1968, he worked as the Officer-in-charge, CFTRI Experiment Station, Nagpur, and developed into a full-fledged research laboratory with necessary complement of pilot plant. In 1966, he was promoted to next higher grade of Scientist. In 1968, he was posted as Scientist-in-charge, CFTRI Experiment Station, Hyderabad, after its shifting from Kodur. In 1973, he was transferred to Experiment Station, Ludhiana.

He has a long research experience and has carried out investigations on a number of problems of fruit and vegetable preservation industry. His major contributions have been development of in-package fumigation technique for storage and transportation of grapes, utilisation of mango waste, development of products from custard apple fruit, and improved economic method for canning orange segments, assessment of processing suitability of tomato and peas varieties and rendering technical help and guidance to entrepreneurs and fruit processing factories.

Shri M. V. Sastry

Shri M. V. Sastry has been elected Honorary Secretary, Association of Food Scientists and Technologists (India), at the Annual Conference held in April 1975.

Shri M. V. Sastry is Scientist, Fruit and Vegetable Technology Discipline, CFTRI. He is a graduate from Andhra University.



He passed his M.Sc. (Biochemistry) from Govt. Agricultural College, Panna. He submitted a thesis on the 'Biochemical Studies of Indian Fruits'.

He worked as a chemist in T.D.M. (Explosives) and Oil Technological Institute, Anantapur, before joining CFTRI research scholar. He worked for one year at the Industrial Liaison Office of CSIR, Jaipur. After rejoining CFTRI, he was promoted as Scientist C in 1973.

Shri Sastry has several research papers to his credit, in the field of traditional food based on fruits and vegetables, individually and in collaboration with colleagues. He worked as Secretary, Food Research Institute Gyrakhana. As a chief promoter of CFTRI ECC stores, he started the co-operative society. He revived the AFST Branch and worked as its Joint Secretary and Vice-President. He was Secretary of combined committee CFTRI Canteen and Hostel for students. He is an M.Sc. Food Technology Course graduate. At present he is an active member of AFST (Association of Food Scientists and Technologists, India) and has served as Corollor, Treasurer and Joint Secretary. He is an invitee for Executive Committee member of AIFPA to represent AFST view point for the year 1975-76. He has taken the

ordinating the activities of AFST, and similar other organisations in the field of food to achieve a place for Indian Science and Technology.

Bhupinder Kaur



Bhupinder Kaur is Research Assistant in Food Technology, Department of Food Processing and Agricultural Structures, College of Agricultural Engineering, Punjab Agricultural University, Ludhiana, since

born on 20th November 1948 in Ludhiana. She did Higher Secondary from the Government School in 1966. She did B.Sc. (Home Science) in 1970 and M.Sc. (Food Technology) in 1972 from the Punjab Agricultural University under the ICAR Scholarship.

She worked as lecturer in Home Science for some time in Government College, Bathinda and Ludhiana before joining as Research Assistant.

She has a number of publications to her credit. At present she is working on research projects like dehydration of leafy vegetables, milling characteristics of oilseeds, and Techno-economic Survey for development of oilseeds-based industry in Punjab sponsored by Department of Agriculture, Government of Punjab.

Miss Urmil Bindra



Miss Urmil Bindra is lecturer, Department of Child Development, College of Home Science, Punjab Agricultural University, Ludhiana, since March 1973.

Born on 2nd July 1949 in Ludhiana, she completed her Higher Secondary Examination from Govt. School, Ludhiana. She did B.Sc. Home Science in 1970 followed by M.Sc. in Food Science and Technology in 1972, from Punjab Agricultural University, Ludhiana, and specialised in Fruits and Vegetables. Her topic for Research was 'Utilization of Local fruits with special reference to musk-melon (*Cucumis melo* L.) in Food Industry'. She was awarded college gold medal in debates and declamations and got many prizes in sports, dramatics, music, and poetry. She is a basketball player.

In addition to being a lecturer she is also a teacher incharge for National Service Scheme because of interest in social service. She has organised many youth leadership training camps, youth against famine and youth against dirt and disease campaigns in the villages and at hill stations.

Miss Bindra proposes to do Ph.D. in Food and Nutrition or Food Science and Technology. She has about 10 publications to her credit in journals like Journal of Food Science and Technology, Indian Food Packer, and Progressive Farming.

Srimathi Gurdeep Kaur

Srimathi Gurdeep Kaur is the Research Assistant (Chemistry), Vegetable Crops, Landscaping and Floriculture, Punjab Agricultural University, Ludhiana, since 1972.

Born in 1950, Gurdeep Kaur did her High School in Government School. After completing B.Sc. (Hons), she did M.Sc. (Hons) in chemistry from the Punjab Agricultural University in 1971 in First Division.

Before joining the Punjab Agricultural University, she worked for some time as a lecturer at Amritsar and Khanna. At present she is doing research on biochemical analysis of vegetables.



Dr (Mrs) E. M. Verbeek-Inckel

Dr (Mrs) E. M. Verbeek-Inckel, who made a career as a flavourist, completed 40 years of service on July 15, 1975, with N.V. Chemische Fabriek 'Naarden', at present Naarden International.

After having studied chemistry, she came to 'Naarden' in 1935. The research on flavours and fragrances in the laboratory of Naarden intrigued her so much that she took the opportunity to write her thesis



tribution to the knowledge of the 'Science of Ketones'. This was the basis of her graduation at the University of Bonn in January 1939.

She contributed to shaping the development of the company in this sector. Many lectures by her have appeared and she is a member of various drafting committees. By lectures and articles on the function of food in food and drinks she has taken a stand against the often excessive fear of chemical additions to food, based only on emotional arguments and not on scientific facts.

Over the course of years, her activities as a chemist were superseded by her work as an expert on Food Laws. She was a member of various committees, and a delegate to the Netherlands flavour and fragrance conference in the preparatory committee for harmonization of the Food Laws in the member countries. Her contribution to the information the government needed for judging flavour and flavour compounds from a point of view of national interest have been very helpful. Internationally for many years she took part in the often and helpful sharp discussions on technical problems submitted to the International Organization of the Flavour Industry (I.O.F.I.).

Indian Institute of Foreign Trade

The Tenth Annual General Meeting of the Indian Institute of Foreign Trade was held on November 28, 1974, at India International Centre, New Delhi.

Mr. Y. T. Shah, Chairman, welcomed the members and invitees. He reviewed the economic situation with particular reference to India's exports during 1973-74. He also gave the details of the Institute's activities during the year and outlined the plans for its planning for the future.

-AUGUST 1975

Shri H. P. Nanda and others congratulated the Chairman for his review of the economic scene. Shri Ramnag Singh and some members advocated that the Institute should strive to have its own building complex as early as possible. Dr. Ram Gopal Aggarwal mentioned about the scope for India's skilled and technical manpower finding suitable and gainful employment in West Asian markets. Shri B. K. Sanyal explained the procedures relating to our skilled and technical manpower finding outlets abroad. The subject, he explained, was handled by the Economic Division in the Ministry of External Affairs.

Tata Oil Mills Co. Ltd., Bombay

The Fifty-seventh Annual General Meeting of the Tata Oil Mills Co. Ltd., Bombay, was held at Baria Matamshri Sahbhagar on Tuesday, 26th August 1975.

The Company's operations showed an increase of 20 per cent over that of previous year: it was Rs 79.93 crores as against Rs 66.38 crores and the profits were 527.40 lakhs as compared to Rs 284.44 lakhs.

The Malaysian project, UNITATA, commenced operations with the production of vegetable oil and soaps.

Tata Oil Mills received the Export Award of the Basic Chemicals, Pharmaceuticals and Cosmetics Export Promotion Council for the best export performance in soap, detergents, cosmetics and toiletries during 1972-73.

Lakme, a subsidiary of Tata's, sales were Rs 343.12 lakhs as compared to Rs 284.36 lakhs the previous year, but the profits were Rs 8.92 lakhs as compared to Rs 10.26 lakhs the previous year. Due to 100 per cent increase in central excise duty on cosmetics the sales were not as envisaged, but this opened up new markets abroad.

International Fisheries Ltd. increased its sales from Rs 12,91,929 to Rs 15,06,835 and showed a profit of Rs 1,43,027.

The Metal Box Company of India Ltd.

The Forty-second Annual General Body Meeting of the Metal Box Company of India Ltd. was held on 12th September 1975 at the registered office, 59-c Chowringhee Road, Calcutta-20.

Sales amounted to Rs 567 million, an improvement over the previous year by Rs 8.8 million and the profits were Rs 32 million, an increase of 9 million over last year. Sale of paper, plastic products and machinery and some other packages increased though most of the profit was due to increase in prices effected the previous year. The Company proposes a dividend of 14 per cent.

Exports increased to 16 million from Rs 7.1 million the previous year, and the Company has been recognised as an eligible Export House.

Several new machines in packaging line were developed with Company's own Technical Development Division. Government has approved technical collaboration with European firms for the manufacture of off-set printing machines. It is hoped the interest the Company has acquired in a glass manufacturing company in Bangalore and a Joint Sector Company for the manufacture of letter press printing machines in Kanpur will help further growth opportunities for the Company. The

Company has received Letter of Intent for the manufacture of ball bearings, cylindrical and taper roller bearings.

Kosmek Plastics, a subsidiary of Metal Box, increased its sales by Rs 2.3 million over the previous year. The sale amounted to Rs 19 million but the profits were Rs 48,000 compared to last year's Rs 1 million.

Automatic Cartoning Machine

The Metal Box Company of India Limited have introduced, for the first time in the country, a Continuous Motion Cartoning machine, manufactured under licence from Messrs Industrie-Werke Karlsruhe Augsburg (IWKA) of West Germany. The distinctive features of the machine include manual or automatic product feed, pneumatic carton pick-up from stack, carton opening, insertion of article into open carton and carton closing (reversed or straight tuck). Output rate is infinitely variable between 75 to 220 cartons per minute depending on the pack size. Carton size range varies from 75 x 25 x 20 mm to the maximum of 220 x 70 x 70 mm outside dimensions. The machine can handle a very large variety of products including tubes, bottles, blisterpacks, soaps, bearings, electric bulbs, ampoules, vials, bags and pouches. Suitable product infeed systems



with linkups with tubefillers, conveyor, etc. can be supplied to meet individual user's requirements. Safety features as on article—no carton and no carton machine stops, are a part of the standard line. Auxiliary devices viz. extension feed chain or embossing attachment can be supplied on request. The manning requirement is one operator per machine. Overall dimensions of the machine 0 m×4.0 m×1.6 m and it weighs only 1500 kg. Enquiries may be addressed to: Metal Box Company of India Ltd., Machinery Building Factory, B2, Road, Calcutta 700 043.

Hindustan Lever Limited

The annual General Meeting of the Hindustan Lever Limited for the year ended 1974 was held on Friday, 20th June at Hindustan Lever House, Backbay, Colaba, Bombay. Shri T. Thomas, Chairman, presented the report. Sales for the year amounted to Rs 145.12 lakhs as compared to Rs 132.68 lakhs the previous

production of soap which suffered a set back on account of shortage of raw materials. High cost started recovering the lost ground and the introduction of Janata Soap 'All' received consumer acceptance. The production of Vanaspathi and edible oils curtailed. The sale of Etah Dairy has stayed at the request of employees in an attempt to improve its working. Government approval has been given under Foreign Exchange regulation for the sale of Tiruchi-elli Factory.

Poultry feed suffered a set back but the output expanded. The government has given industrial licence for a detergent plant at Jammu and Kashmir and a plant for manufacture of Ossein in Maharashtra.

The exports amounted to Rs 13.72 crores against Rs 6.70 crores during 1973. Index-

port Limited has been taken over by the Company for operational reasons.

Poysha Industrial Co. Ltd.

Poysha Industrial Company has improved its results for the year ended March 1975. The turnover has risen by 35.6 per cent to Rs 13.82 crores from Rs 10.19 crores. The gross profit is Rs 108.58 lakhs as against Rs 77.02 lakhs, an increase of 41 per cent. The net profit is Rs 38.94 lakhs against Rs 28.09 lakhs which is 39 per cent.

The Company proposes to set up two more new plants at Madras and Calcutta. A new agreement with American Can Company for manufacture of container making machinery is in final stages. Also there is a proposal for manufacture of composite cans.

Trade Development Authority

The Fifth Annual Report was presented at the General Meeting held on 23rd June 1975 at New Delhi by Shri Y. T. Shah, Chairman. Total exports of TDA's clients amounted to Rs 64.86 crores, of which the exports from small units amounted to Rs 33.86 crores. TDA established closer contacts with departmental stores, chain stores, mail order houses and original equipments markets. TDA carried out a pioneering study with regard to the establishment of a free port at Andaman and Nicobar Islands. TDA has finalised a project for setting up industrial information centre on the lines of the trade information centres with the assistance of UNDP. It has been accorded full membership of the World Trade Centres' Association. TDA organised a buyer-seller's meet in London. With the result Commonwealth Fund for Technical Centre (CFTC) and International Trade Centre (GATT/UNCTAD) have promised assistance for organising similar meets in other countries. TDA participated in the 'Electronica 1974' at Munich, in November 1974. 30 prominent

business representing departmental stores, mail order houses, buying co-ventures as also importers and manufacturers visited India under the auspices of TDA. A regional office was set up early in February 1975 in the Air India buildings to offer state-of-the-art personalised package service to interested parties in Bombay. The Government has approved an export processing zone near Thane there and a project for ready-made garments at Gurgaon, Haryana.

As on March 1975 the number of clients of TDA's list remained at 502 including 85 new ones enrolled during the year; a few were removed from the rolls for unsatisfactory performance.

One of the leading manufacturers of industrial valves in the Federal Republic of Germany will transfer its plant consisting of machinery and tools valued at Rs 9 lakhs and will buy back 50 per cent of the production. Similarly, a plant manufacturing bicycle chain, wheel and crank from Belgium valued at Rs 26 lakhs will be transferred to India and it will buy 50 per cent of the production. Another West German firm will transfer the plant valued at Rs 7.5 lakhs for the manufacture of ready-made cement and they have undertaken to buy 75 per cent of the production amounting Rs 5 crores over a period of 5 years. An Australian firm will transfer tools, dies, patterns and equipment for the manufacture of F10P motors and will meet its demand in Australia from the Indian manufacturers. There is an agreement for collaboration with a USA firm for manufacture of TV picture tubes and electronic equipment.

The Food Corporation of India

The Food Corporation of India has launched a consultancy service to extend guidance on process technology for agricultural products. The service is available for private, public and co-operatives.

The FCI will undertake project for studies, product diversification, processing, regional identification of industrial, availability of raw material, infrastructure requirements. The will also include management systems, business studies, warehousing, resource allocation, handling and costs, production planning, inventory control, information and appraisal, views on potential demand, market & market segmentation and market studies of distribution channel and sales strategy will form basis of the

New India Fisheries

New India Fisheries has turned discouraging results for the year March 1975 with a loss of Rs 19.84 against a profit of Rs 3.27 lakhs the previous year. The sales increased to Rs 112.47 lakhs as compared to Rs 117.47 lakhs dividend has been declared.

The loss is due to the depression in the overseas fish market on with fuel crisis and inflation. The sales dropped from 11.12 lakhs to Rs 8.5. The trader operations remained unaffected from the middle of October last till a strike by the floating staff, and from the trader operations have been down due to uncoordinated operations.

The Company proposes to take various steps to improve the utilisation of the plant.

Advertising Club, Bombay

The Twenty-first Annual Meeting of the Club was held on March 1975 at Hotel Nataraj. Dr. Shri Rajar Patel, President, delivered an interesting and to the point address having the necessity of greater involvement in Club's activities sought assistance for the Club's premises and the Holiday Home.

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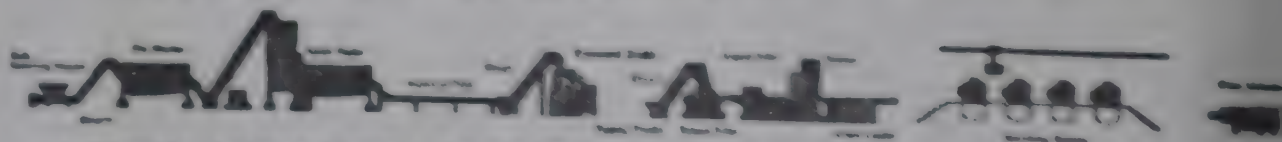
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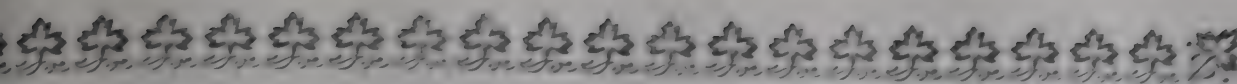
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Dipy's

LIVE-HAPPY FOODS



HERBERTSONS LIMITED
Homi Mody Street, Bombay 400 023.

Dipy's colourful packaging has contents just as tempting. All Dipy's products are made from fresh fruits and vegetables. They retain the goodness of natural vitamins. Dipy's delightful range is wide enough to suit all your tastes.

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Guess who's
been doing a plum job
of selling?

Here's who.

Right now somewhere, a can of delicious fruits is fast disappearing.

You don't even realise it but our cans have been helping to bring you the things you use every day: fruits and vegetables, baby foods, cosmetics, fish, ghee and vanaspati, pharmaceuticals, paints, motor-oils. All with their quality intact.

Our way of doing it is with the most modern technology.

We are an associate of the world's largest can manufacturer, the American Can Company. Through us, the fruits

of their over \$ 20,000,000 annual research and development programme are available to canners and consumers in India.

Which means better and more cans for you, naturally.

Things you can't do without, Poysha can



POYSHA
INDUSTRIAL CO. LTD.

Bombay • Ghaziabad • Cochin

Subsidiaries: Kaira Can Co. Ltd., Anand
Colrige Ltd., Bombay

Collector's item

A perfect example of a perfect package
and a complete packaging system.
The result of Nature's continuing research
over thousands of years. Like Nature,
Metal Box (40 years in packaging)
believes in producing not just the perfect
package but an optimum packaging
system as well. Using diverse materials
expertly—metal, paper and
plastics. Years of Research
and Development
see to that.



things are happening at Metal Box
-much more than metal boxes

